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ABSTRACT

This federally funded report provides the results of a task inventory analysis survey for data processing occupations. Presented before completion of the major project so that pertinent occupational data may be available for curriculum developers, instructors, and others involved in planning and conducting vocational and technical programs, this interim report will constitute part of a system for revising and designing curriculums for 1- or 2-year post secondary educational programs in data processing. A task inventory was constructed and validated by means of a literature review and an analysis by five consultants employed in data processing. A random sample of 38 data processing installations yielded usable responses from 406 out of 500 workers sampled by means of interviews and the task inventory. Task performance frequencies, task commonalities, and time allotments were determined. Job descriptions for data processing were validated and an occupational career ladder was found to be clearly indicated from the lowest to the highest job titles. Statistical results are appended. (AG)

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Research and Development Series No. 88

Business Data Processing Occupational Performance Survey

THE CENTER FOR VOCATIONAL
AND TECHNICAL EDUCATION

THE OHIO STATE UNIVERSITY
1960 Kenny Rd., Columbus, Ohio 43210

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Research and Development Series No. 88

BUSINESS DATA PROCESSING OCCUPATIONAL PERFORMANCE SURVEY

Interim Report

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1960 Kenny Road
Columbus, Ohio 43210
March 1973

An Interim Report
on a Project Conducted under
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FOREWORD

A continued programmatic effort at The Center for Vocational and Technical Education is to develop more effective procedures for curriculum development. One product of this effort is this interim report of the business data processing task inventory survey. Data reported herein were collected and analyzed as a preliminary stage of a long-range effort to develop a set of generic procedures for the development of up-to-date curricula in vocational and technical education. This research was conducted within the Instructional Systems Design Program at The Center.

It is hoped that the revised task inventory contained in this report will be useful to practitioners across the country while development of procedures for designing improved curricula continues. The Center welcomes any questions, criticisms, or other comments which may be helpful to the research team in their continuing efforts.

The profession owes its thanks to Sidney D. Borcher, former research specialist at The Center and currently director of the Arizona Research Coordinating Unit, and to John W. Joyner, research associate, for their work in preparing this report. Assistance was also provided by Paul B. Leiter, research associate. The Center also expresses its appreciation to the many individuals in the field of business data processing for their interest and cooperation in the study

Robert E. Taylor
Director
The Center for Vocational
and Technical Education

TABLE OF CONTENTS

PAGE

Foreword . . . iii
List of Tables . . . vii
Chapter
I. Introduction . . . 3
Purpose of the Study . . . 3
Definition of the Business Data Processing Occupational Area . . . 3

II. Methodology . . . 5
Construction of the Task Inventory . . . 5
Consultant Review of the Task Inventory . . . 5
Selection of the Worker Sample . . . 5
Data Collection Procedures . . . 5

III. Findings . . . 7
Description of the Worker Sample . . . 7
Task Job Descriptions . . . 7
Description of Differences in Tasks Being Performed by Computer Console Operators and Data Converting Operators . . . 7
Description of Differences in Tasks Being Performed by Programmers and Computer Console Operators . . . 8
Description of Differences in Tasks Being Performed by Systems Personnel and Programmers . . . 8
Description of Differences in Tasks Being Performed by Managers and Programmers . . . 8
Description of Differences in Tasks Being Performed by Managers and Systems Personnel . . . 8
Revision of the Task Inventory Based on the Validation . . . 48

IV. Summary and Conclusions . . . 51
Appendix A – Criteria for Appropriate Task Inventory Statements . . . 53
Appendix B – Task Inventory Specimens . . . 57
Appendix C – Original Business Data Processing Task Inventory . . . 63
Appendix D – Revised Business Data Processing Task Inventory . . . 75

LIST OF TABLES

TABLE		PAGE
1.	Distribution of Respondents by Job Title and Type of Business	9
2.	Frequency of Worker Responses by Job Title to the Question of Where They Received Their Training in Computer Data Processing	10
3.	Task Job Description for Data Converting Operators (N=53)	11
4.	Task Job Description for Computer Console Operators (N=61)	13
5.	Task Job Description for Programmers (N=107)	15
6.	Task Job Description for Systems Personnel (N=71)	19
7.	Task Job Description for Managers (N=62)	27
8.	Description of the Differences in the Percent of Data Converting Operators and the Percent of Computer Console Operators Performing the Same Tasks	34
9.	Description of the Differences in the Percent of Programmers and the Percent of Computer Console Operators Performing the Same Tasks	36
10.	Description of the Differences in the Percent of Systems Personnel and the Percent of Programmers Performing the Same Tasks	39
11.	Description of the Differences in the Percent of Managers and the Percent of Programmers Performing the Same Tasks	41
12.	Description of the Differences in the Percent of Managers and the Percent of Systems Personnel Performing the Same Tasks	45

BUSINESS DATA PROCESSING OCCUPATIONAL PERFORMANCE SURVEY

CHAPTER I
INTRODUCTION

Purpose of the Study

The Center for Vocational and Technical Education is developing a system for acquiring and using occupational information effectively in revising and designing curricula. This interim report is offered before completion of the major project so that the occupational information collected during the development of the system may be available for use by curriculum developers, instructors, and others involved in planning and conducting vocational and technical programs.

One of the occupational areas surveyed in the initial piloting of the system was business data processing. It is the purpose of this report to present the results of the task inventory analysis survey conducted by the project staff for the data processing occupational area. The objectives of the task inventory analysis were as follows:

1. To construct and validate a task inventory for the business data processing occupational area
2. To determine the frequency of performance of tasks by incumbent workers in the data processing occupations
3. To determine the relative time spent in performing specific tasks by incumbent workers in the data processing occupations
4. To validate job descriptions for the job titles within the data processing occupational area.
5. To determine what tasks are common to all jobs within the data processing occupational area.

Definition of the Business Data Processing Occupational Area

Computers are the modern means of leveling the mountains of paperwork necessary for maintaining a business. In all types of businesses, computers and other data processing equipment are performing numerous indispensable operations.

Amazing as they are, sophisticated data processing machines can only carry out the prepared instructions worked out step by step by highly trained data processing workers. Worker functions related to the operation of electronic data processing equipment include reviewing program instructions, determining procedures for a specific run, readying equipment for operation, and manipulating and monitoring controls during operation. Also, the operation of peripheral programming and design of data processing systems.

The following job classifications are included:

1. Manager of electronic data processing
2. Supervisor of computer operations
3. Systems and procedures analysts
4. Programmer–junior, lead, or senior
5. Computer console operator

The purpose of the survey was to collect occupational information that would be useful for revising and designing one- and two-year post-high school data processing programs. Therefore, the job titles of tape librarian, key puncher, verifier, and unit record operator were omitted from the survey.

CHAPTER II

METHODOLOGY

Construction of the Task Inventory

Task statements were identified by searching existing data processing task lists, job descriptions, and curriculum guides. All tasks that were thought to be performed by incumbent workers in the data processing occupational area were assembled into one composite list.

Following the initial identification, the tasks were grouped into functional areas called "Duties." Action words ending in "ing" (gerunds) were used to designate duties. The duty categories identified were:

1. Supervising data services functions
2. Supervising management analysis
3. Supervising automatic data processing equipment operations
4. Supervising programming
5. Supervising data systems analysis and design
6. Performing data processing functions
7. Performing management analysis functions
8. Operating automatic data processing equipment
9. Performing systems programming
10. Performing scientific programming
11. Programming computers
12. Performing feasibility studies (pilot projects)
13. Designing data systems
14. Performing data systems analysis

After the task statements were grouped under the appropriate duties, each task statement was carefully reviewed and rewritten into the proper format (see Appendix A). Each task statement was written so as to begin with a present tense action word with the subject "I" understood. The task statements were arranged alphabetically under each duty so as to shorten incumbents' reading time and to assist them in recalling tasks which were not listed. In all, 445 task statements were included in the original inventory (see Appendix C) along with five pertinent background information questions.

Consultant Review of the Task Inventory

After the initial task inventory had been constructed from published sources, it was reviewed by five consultants employed in data processing. One of the consultants was a computer operator, one was a senior programmer, two were supervisors of computer operations, and the fifth was an operation supervisor. These five consultants were individually interviewed by project staff members.

The consultants were asked to respond to each task individually and comment on its clarity and appropriateness. The comments of the five consultants were pooled and revisions of the task inventory were made based on the consultants' inputs.

Selection of the Worker Sample

Since the duties and tasks performed by data processing workers are primarily related to position held, size, and type of computer installation in which they are employed, it was felt unnecessary to consider geographic location in selecting a sample of incumbent data processing workers. Therefore, a random sample of all data processing installations located around a single metropolitan area (Columbus, Ohio) was considered sufficient for the purposes of this study.

It was impossible to secure a complete list of the names and addresses of incumbent data processing workers for all job titles within the business data processing occupational area. Therefore, a random sample of data processing installations was drawn and representative samples of the data processing employees within each installation were obtained.

A sample of thirty-eight data processing installations was randomly selected from the 174 installations identified by the 1970-71 *Inventory of Data Processing Facilities* compiled by The Columbus Area Chamber of Commerce. The 174 installations in the Columbus, Ohio metropolitan area consisted of 150 private companies and organizations and twenty-four governmental departments, agencies, and school systems. Together, these installations reported the employment of nearly 5,600 data processing personnel, including over 1,500 system analysts and programmers. The thirty-eight installations included in the sample consisted of thirty-one private companies and organizations and five governmental departments, agencies, and school systems.

Data Collection Procedures

A tentative contact schedule was arranged for personal interviews with the person in charge of each of the data processing installations included in the sample. Approximately one week before the tentative interview date each business was telephoned to arrange a specific appointment time. The purposes of the initial interview were: (1) to explain the purposes of the study, (2) to emphasize the value of the study to the industry, (3) to solicit the cooperation and participation of that installation, (4) to determine the organizational structure of the personnel within the business, (5) to determine the number and job titles of the workers to receive the inventories, and (6) to explain how the inventories were to be filled out and returned.

Following the interview, the needed number of data processing inventory packets was delivered to the head of the installation for him to distribute to his employees. A total of

500 packets were distributed. Each packet contained the following items:

1. A letter of introduction from The Center staff
2. The data processing task inventory complete with instructions on how to fill it out
3. A postage-paid return envelope
4. A complimentary ball point pen as an incentive for completing and returning the inventory

Some installations preferred to have each employee individually fill out and mail the completed inventory directly to The Center for Vocational and Technical Education, while others preferred to collect the completed inventories from their employees and forward them to The Center all at once. Generally a higher response was received when the employees were asked to complete the inventory and return them to their supervisors.

Each of the respondents was asked to answer the five background information questions and check the tasks they perform on their present job. After they had checked the tasks they perform, the respondents were then asked to go back and rate those tasks they had checked on a seven point "relative time-spent" scale. A rating of one indicated that the respondent spent very little total time on the task, as compared with the time he spent on each of the other tasks he performed. A rating of seven indicated that he spent a very large amount of his total time performing that particular task as compared to the other tasks he performed. Examples of the instructions and rating scale are presented in Appendix B.

To permit comparisons across respondents on specific tasks, the relative time-spent ratings were converted to percent values. These values are regarded as estimates of the percent of work time spent by the respondents on each task. It is assumed that the total of the respondent's raw ratings represents 100 percent of his work time. Based on this assumption, each raw rating is expressed as a percent of that total. The following formula was used in converting the raw ratings to percentages of time spent:

$$\frac{r_1}{\sum_{i}^{n} r_i} \times 100$$

where r_1 = the rating provided by a respondent on task i, and

$\sum_{i}^{n} r_i$ = the sum of a respondent's ratings on the n task he performs.

CHAPTER III
FINDINGS

Description of the Worker Sample

The distribution of workers by job title and type of business in which they were employed is given in Table 1. The total number of respondents represented in the study was 406, or 81 percent of the 500 workers sampled. The respondents were distributed almost equally across the job titles. Managerial job titles represented 15.3 percent of the respondents, 17.5 percent were employed as systems personnel, 26.3 percent as programmers, 15 percent were computer console operators and 13.4 percent were employed as data converting operators. Job titles not listed in any one of the five stated categories above were checked by the respondents as "other" on the original inventory. This group consisted of 12.8 percent of the total respondents in the study.

The largest proportion of respondents (35.5 percent) were employed in government, 23.2 percent were employed in manufacturing type businesses, 17 percent were employed in insurance and 12.1 percent in distribution (wholesale-retail), 3.9 percent in research and education; a smaller proportion of 2.2 percent and less were employed in other and remaining types of businesses as indicated in Table 1.

The frequency of worker responses to the question of where they received their training in computer data processing is given in Table 2. It should be noted that a respondent could check more than one source of training; therefore, the total number of responses (715) is greater than the number of workers (406) included in the study.

Over 37 percent (37.3) of the workers checked on-the-job (self-learned) as the most frequent source of training received in data processing; 20.3 percent received training in programs offered by equipment manufacturers, and 17.5 percent received training offered by company-in-plant training programs. Training received in educational institutions show that 11.5 percent of the respondents had received training at a college or university, 4.5 percent received training at private business schools, 3.9 percent at public vocational technical schools, and 1 percent at public secondary schools. Correspondence courses accounted for 2.2 percent of the responses as to where the workers received their training, and 1.8 percent checked military training school as the place of training received in data processing.

Task Job Descriptions

Task job descriptions in data processing were computed for the job title of: (1) managers, (2) systems personnel, (3) programmers, (4) computer console operators, and (5) data converting operators. These five job titles were grouped from the responses of the workers to ten job titles listed on the original inventory. Inspection of the tasks checked by the workers who possessed the job titles of manager of data processing, manager of computer operations, and manager of EDP (Electronic Data Processing) revealed that the tasks they performed were similar. Therefore, the respondents in these job titles were combined to generate the composite task job description for all managers in data processing. Job titles relative to task descriptions for programmers were also combined in their respective areas for the same reason. A second rationale that supports the combining of sub-job titles lies in the similarity of tasks performed by the workers between job titles as well as within job titles.

The task descriptions for the five consolidated job titles are presented in Tables 3, 4, 5, 6 and 7. The letter and number in the column labeled D-TSK (duty-task) refer to the location of the task on the inventory that was administered to the respondents. The letter refers to the duty heading under which the task was categorized and the number indicates the alphabetical rank of the task under that duty heading.

The four columns of figures to the right of the task statements have been calculated to show by job title: the percent of members performing each task, the average relative time spent by the members performing the task, the average relative time spent by all members, and a cumulative sum of the average percent time spent by all members. The reader is directed back to the data collection section of the methodology chapter for an explanation of how the average relative time spent figures were computed.

An examination of the task job descriptions in a broad perspective shows an overlapping of a variety of tasks performed by managers, systems personnel, and programmers. Computer console operators and data converting operators appear to be limited to a specific and small number of well defined tasks as a function of their normal job duties.

Description of Differences in Tasks Being Performed by Computer Console Operators and Data Converting Operators

A description of the differences in the percent of computer console operators and the percent of data converting operators performing the same tasks is provided in Table 8. Those tasks with less than a 20 percent difference between the two groups with respect to the number of individuals performing were omitted from the table, as the intent was to present only those tasks for which a large difference in frequency of performance existed. Inspection of the table revealed that both groups performed similar tasks in data processing functions. A much higher percent of computer console operators performed tasks in data processing functions than did data converting operators. Several tasks in data

processing functions were not performed by data converting operators but listed as being performed by 20 percent or more of the computer console operators.

There were only four tasks showing a higher percent of data converting operators performing than computer console operators. Three of these tasks related to operating automatic data processing equipment and one task related to preparing data for testing new systems. Two of the four tasks were listed as not being performed by computer console operators.

Description of Differences in Tasks Being Performed by Programmers and Computer Console Operators

A description of the differences in the percent of computer console operators and the percent of programmers performing the same tasks is provided in Table 9. Only those tasks with a difference between the groups of 20 percent or more are presented.

Examination of the data in Table 9 revealed that a high difference can be noted in the percent performing of both groups relative to the tasks unique to either group. A higher percent of computer console operators performed tasks related to operating automatic data processing equipment while a higher percent of programmers performed tasks related to programming computers. All tasks listed that show a higher percent of computer console operators performing were performed by programmers. However, there were several tasks performed by programmers but not performed by computer console operators.

Description of Differences in Tasks Being Performed by Systems Personnel and Programmers

Description of the differences in the percent of systems personnel and the percent of programmers performing the same tasks is provided in Table 10. Those tasks with less than a 20 percent difference between the two groups with respect to the number of individuals performing were omitted from the table since the intent was to present only those tasks for which large differences in frequency of performance existed.

Inspection of Table 10 revealed that systems personnel and programmers perform tasks which tend to overlap but may be held as a general duty responsibility of one group or the other. The tasks preceded by the letter K refer to computer programming functions which are performed by a higher percent of programmers. The tasks preceded by the letters M and N refer to designing data systems and performing data systems analysis and are performed by a higher percent of systems personnel.

Description of Differences in Tasks Being Performed by Managers and Programmers

Description of the differences in the percent of data processing managers and programmers performing the same task is given in Table 11. Tasks showing a less than 20 percent difference in performance between the two groups were omitted.

Inspection of the table revealed that a higher percent of managers perform a wide range of tasks at the managerial and supervisory levels, plus a large number of tasks that are performed by programmrs. There are several specific tasks at the managerial and supervisory levels that are not performed by programmers. However, from 22 to 5 percent of the managers perform programming task duties as a part of their normal job function.

A factor which may explain the variance in the above data might be the wide range in size of the data processing installations included in the survey. A small installation will likely have its managers perform many tasks outside of managerial and supervisory functions where as a larger installation with more personnel or a larger staff have a tendency to specialize its personnel tailored to the nature of business functions.

Description of Differences in Tasks Being Performed by Managers and Systems Personnel

Description of the differences in the percent of managers and the percent of systems personnel performing the same tasks in data processing is provided in Table 12. Inspection of the table revealed that a larger percent of managers performed tasks related to managerial and supervisory functions than did systems personnel. However, there are very few tasks performed by managers that are not performed by at least a few systems personnel. In most cases the percent performing by the latter group may be very small when related to managerial and supervisory tasks. Tasks showing a higher percent of systems personnel performing were related to the duties of: programming computers, designing data systems, and performing data systems analysis. All tasks showing a higher percent of systems personnel performing were performed in some instances by managers. Again, as in the difference description for programmers and systems personnel, a definite career personnel and managers.

TABLE 1 Distribution of Respondents by Job Title and Type of Business

JOB TITLE		TYPE OF BUSINESS											
		Manufacturing	Insurance	Distribution (Wholesale-Retail)	Banking Finance	Data Processing Service Bureaus	Public Utilities	Research & Education	Government	Publishing	Construction	Others	Total
Manager Data Processing	(N)	9	1	3	0	1	1	0	6	0	2	2	25
	(%)	2.2	.2	.7	0	.2	.2	0	1.5	0	.5	.5	6.2
Manager Computer Operations	(N)	10	2	4	1	1	0	2	11	0	0	0	31
	(%)	2.5	.5	1.0	.2	.2	0	.5	2.7	0	0	0	7.6
Manager EDP	(N)	1	2	2	0	0	0	0	1	0	0	0	6
	(%)	.2	.5	.5	0	0	0	0	.2	0	0	0	1.5
Systems Engineer	(N)	3	0	0	0	0	0	1	0	0	0	0	4
	(%)	.7	0	0	0	0	0	.2	0	0	0	0	1.0
Systems Programmers	(N)	8	3	2	0	1	0	1	7	0	0	0	22
	(%)	2.0	.7	.5	0	.2	0	.2	1.7	0	0	0	5.4
Systems and Procedures Analysts	(N)	6	4	5	1	2	0	3	22	0	1	1	45
	(%)	1.5	1.0	1.2	.2	.5	0	.7	5.4	0	.2	.2	11.1
Senior Programmers	(N)	6	6	1	1	0	0	1	3	0	0	0	18
	(%)	1.5	1.5	.2	.2	0	0	.2	.7	0	0	0	4.4
Lead Programmers	(N)	1	0	0	1	0	0	0	6	0	0	0	8
	(%)	.2	0	0	.2	0	0	0	1.5	0	0	0	2.0
Programmers	(N)	13	8	7	0	2	0	4	36	0	2	0	72
	(%)	3.2	2.0	1.7	0	.5	0	1.0	8.9	0	.5	0	17.7
Junior Programmers	(N)	2	0	3	0	0	0	1	3	0	0	0	9
	(%)	.5	0	.7	0	0	0	.2	.7	0	0	0	2.2
Computer Console Operators	(N)	11	10	9	1	0	0	2	23	1	1	3	61
	(%)	2.7	2.5	2.2	.2	0	0	.5	5.7	.2	.2	.7	15.0
Data Converting Operators	(N)	13	25	7	0	0	1	0	7	0	0	0	53
	(%)	3.2	6.2	1.7	0	0	.2	0	1.7	0	0	0	13.1
Others	(N)	11	8	6	1	1	0	1	19	0	2	3	61
	(%)	2.7	2.0	1.5	.2	.2	0	.2	4.7	0	.5	.7	12.8
TOTAL	(N)	94	69	49	6	8	2	16	144	1	8	9	406
	(%)	23.2	17.0	12.1	1.5	2.0	.5	3.9	35.5	.2	2.0	2.2	100

TABLE 2 Frequency of Worker Responses by Job Title to the Question of Where They Received Their Training in Computer Data Processing

JOB TITLE		TYPE OF TRAINING										
		On-the-Job (Self learned)	Military Training School	Company in Plant Training Programs	Equipment Manu-facturers Training Program	Corres-pondence Courses	Public Secondary Schools	Public Vocational Technical Schools	Junior College	College or University	Private Business Schools	Total
Manager Data Processing	(N)	20	2	11	19	4	0	0	1	1	1	59
	(%)	7.5	15.4	8.8	13.1	25.0	0	0	14.3	1.2	3.4	8.3
Manager Computer Operations	(N)	24	2	10	13	2	0	4	0	7	2	64
	(%)	9.0	15.4	8.0	9.0	12.5	0	14.3	0	8.5	6.9	9.0
Manager EDP	(N)	4	0	3	2	0	0	0	0	2	0	11
	(%)	1.5	0	2.4	1.4	0	0	0	0	2.4	0	1.5
Systems Engineer	(N)	2	0	.8	2.1	0	0	0	0	1	0	7
	(%)	.7	0	.8	2.1	0	0	0	0	1.2	0	1.0
Systems Programmers	(N)	18	2	9	10	1	0	2	0	3	0	45
	(%)	6.7	15.4	7.2	6.9	6.3	0	7.1	0	3.7	0	6.3
Systems and Procedure Analysts	(N)	34	0	21	21	1	0	1	1	6	4	88
	(%)	12.7		16.8	14.5	6.3	0	3.6	14.3	6.1	13.8	12.3
Senior Programmers	(N)	13	0	8	12	1	0	0	0	0	0	34
	(%)	4.9		6.4	8.3	6.3	0	0	0	0	0	4.8
Lead Programmers	(N)	3	0	5	5	0	0	1	0	1	1	16
	(%)	1.1		4.0	3.4	0	0	3.6	0	1.2	3.4	2.2
Programmers	(N)	47	1	26	26	3	0	5	3	16	2	129
	(%)	17.6	7.7	20.8	17.9	18.8	0	17.9	42.9	19.5	6.9	18.0
Junior Programmers	(N)	8	1	1	0	0	0	1	0	3	0	14
	(%)	3.0	7.7	.8	0	0	0	3.6	0	3.7	0	2.0
Computer Console Operators	(N)	37	3	9	5	4	1	7	0	18	5	89
	(%)	13.9	23.1	7.2	3.4	25.0	33.3	25.0	-	22.0	17.2	12.4
Data Converting Operators	(N)	20	1	5	7	0	2	3	2	19	9	68
	(%)	7.5	7.7	4.0	4.8	0	66.7	10.7	28.6	23.2	31.0	9.5
Others	(N)	37	1	16	22	0	0	4	0	6	5	91
	(%)	13.9	7.7	12.8	15.2	0	0	14.3	0	7.3	17.2	12.7
Total	(N)	267	13	125	145	16	3	28	7	82	29	715
	(%)	37.3	1.8	17.5	20.3	2.2	.4	3.9	1.0	11.5	4.5	100

* Any single respondent may have had more than one training experience.

TABLE 3 Task Job Description for Data Converting Operators (N=53)

Ranked by ..... PERCENT OF MEMBERS PERFORMING
AVERAGE PERCENT TIME SPENT BY MEMBERS PERFORMING
AVERAGE PERCENT TIME SPENT BY ALL MEMBERS
CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS

D-TSK	TASK TITLE				
H 20	Operate key punch machines or verifiers	83.02	53.69	44.57	44.57
H 19	Operate interpreter	41.51	15.92	6.61	51.18
H 21	Operate magnetic tape unit	24 53	63.16	15.49	66.67
H 4	Determine cause of machine stops and malfunctions	22.64	11.05	2.50	69.17
H 26	Operate sorter	20.75	8.85	1.84	71.01
H 31	Perform operator maintenance on automatic data processing equipment	18.87	5.71	1.08	72.09
H 3	Analyze machine operation through use of conditions displayed	18.87	4.81	0.91	73.00
H 2	Analyze machine operation through use of messages received from the equipment	18.87	5.69	1.07	74.07
H 1	Analyze job steps to determine data recovery points	16.98	4.88	0.83	74.90
H 42	Screen reports, cards, or programs for obvious errors and initiate corrections	16.98	7.44	1.26	76.16
F 27	Prepare data service forms	16.98	6.93	1.18	77.34
F 16	Extract figures needed for special analysis and studies	16.98	3.91	0.66	78.00
F 22	Operate office machines	15.09	11.08	1.78	79.78
F 5	Compare data arithmetically with predetermined control totals	15.09	3.82	0.58	80.36
F 4	Code functional area reports	15.09	4.52	0.68	81.04
F 13	Coordinate with operators, programmers, or systems personnel on matters of joint interest	13.21	9.70	1.28	82.32
F 9	Control automatic data processing equipment and data processing equipment orders	13.21	4.43	0.59	82.91
H 25	Operate reproducer	13.21	15.62	2.06	84.97
H 14	Operate collator	13.21	6.95	0.92	85.89
H 12	Make switch settings	11.32	4.91	0.56	86.45
F 3	Check error with consultant, correct and resubmit	11.32	8.41	0.95	87.40
M 20	Prepare or analyze data for testing new systems	11.32	4.24	0.48	87.88
H 13	Operate card reader	7.55	5.63	0.42	88.30
H 10	Maintain levels of data processing supplies	7.55	3.36	0.25	88.55
H 8	Maintain card files (source object, etc.)	7.55	6.27	0.47	89.02
H 54	Wire control panels	7.55	3.45	0.26	89.28
C 27	Requisition supplies	7.55	3.44	0.26	89.54
C 17	Plan and conduct on-the-job training in data processing equipment operation	7.55	4.50	0.34	89.88
A 2	Analyze data processed to make sure that desired information is obtained	7.55	4.56	0.34	90.22
A 5	Coordinate work of data services unit with activities furnishing report data	5.66	1.86	0.11	90.33
A 4	Conduct on-the-job training for data services personnel	5.66	5.02	0.28	90.61
C 12	Inform person of prime responsibility of repeated errors in input data	5.66	2.71	0.15	90.76
C 11	Evaluate work performance of operators	5.66	1.98	0.11	90.87
C 10	Evaluate performance history on specific jobs	5.66	2.79	0.16	91.03
C 4	Coordinate scheduling of machine work load	5.66	3.58	0.20	91.23
A 18	Review machine run reports for accuracy	5.66	2.56	0.15	91.38
C 20	Plan and schedule work assignments for operators	5.66	2.81	0.16	91.54

TABLE 3 continued

D-TSK	TASK TITLE	AVERAGE PERCENT TIME SPENT BY MEMBERS PERFORMING	AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	PERCENT OF MEMBERS PERFORMING	CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS
	Ranked by				
C 18	Plan and conduct on-the-job training in data processing procedures	5.66	2.79	0.16	91.70
C 25	Prepare shift reports	5.66	2.37	0.13	91.83
C 32	Schedule machine inspection and repair	5.66	2.79	0.16	91.99
F 6	Compile progress reports on data processed	5.66	2.60	0.15	92.14
F 10	Control basic input into automated data systems	5.66	10.57	0.60	92.74

TABLE 4 Task Job Description for Computer Console Operators (N=61)

D-TSK	TASK TITLE	Ranked by ..... PERCENT OF MEMBERS PERFORMING	AVERAGE PERCENT TIME SPENT BY MEMBERS PERFORMING	AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS
H 6	Load programs and data cards	93.44	4.52	4.22	4.22
H 4	Determine cause of machine stops and malfunctions	90.16	3.19	2.87	7.09
H 15	Operate console	90.16	4.28	3.86	10.95
H 13	Operate card reader	86.89	3.80	3.30	14.25
H 46	Set up computer for operation	85.25	3.96	3.38	17.63
H 44	Select and mount tapes	85.25	4.10	3.50	21.13
H 43	Select and mount disks	85.25	3.45	2.94	24.07
H 7	Locate tapes in storage media or tape library	81.97	3.04	2.49	26.56
H 28	Perform card-to-printer operation	81.97	2.70	2.21	28.77
H 35	Perform tape-to-printer operation	80.33	3.39	2.72	31.49
H 21	Operate magnetic tape unit	80.33	4.06	3.26	34.75
H 29	Perform compilation or assembly	78.69	2.83	2.23	36.98
H 40	Review processing steps before job is put on computer	78.69	3.51	2.76	39.74
H 2	Analyze machine operation through use of messages received	78.69	3.40	2.67	42.41
H 20	Operate key punch machines or verifiers	77.05	4.56	3.51	45.92
H 31	Perform operator maintenance on automatic data processing equipment	73.77	2.65	1.96	47.88
H 32	Perform punched card-to-tape conversion operation	72.13	2.75	1.99	49.87
H 38	Prepare special carriage control tapes	72.13	1.93	1.39	51.26
H 42	Screen reports, cards, or programs for obvious errors and initiate corrections	68.85	2.70	1.86	53.12
H 26	Operate sorter	67.21	2.91	1.95	55.07
H 3	Analyze machine operation through use of conditions displayed	67.21	3.20	2.15	57.22
H 8	Maintain card files (source object, etc.)	65.57	2.57	1.69	58.91
H 9	Maintain current run tapes	63.93	2.83	1.81	60.72
H 1	Analyze job steps to determine data recovery points	63.93	2.35	1.50	62.22
H 12	Make switch settings	63.93	2.66	1.70	63.92
H 19	Operate interpreter	59.02	2.48	1.47	65.39
H 33	Perform tape-to-card conversion operation	59.02	2.55	1.50	66.89
H 16	Operate decollator	55.74	2.73	1.52	68.41
H 39	Record time log for unscheduled maintenance	54.10	2.34	1.27	69.68
H 30	Perform debugging runs	52.46	2.44	1.28	70.96
H 10	Maintain levels of data processing supplies	50.82	2.39	1.21	72.17
H 18	Operate forms bursting equipment	49.18	2.40	1.18	73.35
H 25	Operate reproducer	49.18	1.82	0.90	74.25
H 14	Operate collator	44.26	2.51	1.11	75.36
H 36	Prepare control decks	44.26	1.78	0.79	76.15
H 5	Interrogate memory locations on the console	44.26	2.00	0.89	77.04
H 50	Strip tape and add new load point	42.62	1.56	0.66	77.70
H 54	Wire control panels	37.70	2.15	0.81	78.51
H 41	Schedule sequence of users during shift for effective organization of runs	37.70	3.09	1.16	79.67
H 47	Splice magnetic tape and leaders	36.07	1.24	0.45	80.12
H 55	Wire reproducer control panels	34.43	1.93	0.66	80.78
H 11	Maintain technical files on equipment operation and procedural changes	34.43	2.30	0.79	81.57
H 17	Operate document writer	31.15	2.78	0.87	82.44

TABLE 4 continued

D-TSK	TASK TITLE	CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	AVERAGE PERCENT TIME SPENT BY MEMBERS PERFORMING	PERCENT OF MEMBERS PERFORMING
	Ranked by				
F 22	Operate office machines	31.15	2.18	0.68	83.12
H 52	Update current source programs	29.51	1.77	0.52	83.64
H 45	Select subroutines to accomplish jobs received for processing	27.87	2.05	0.57	84.21
H 23	Operate punched card accounting machines	27.87	1.83	0.51	84.72
H 37	Prepare service action requests	27.87	2.02	0.56	85.28
H 24	Operate remote terminals	22.95	2.08	0.48	85.76
H 49	Set up punched card accounting machines for operation	21.31	1.80	0.38	86.14
H 22	Operate paper tape punch and reader	19.67	2.94	0.58	86.72
F 13	Coordinate with operators, programmers, or systems personnel on matters of joint interest	19.67	2.20	0.43	87.15
A 4	Conduct on-the-job training for data services personnel	19.67	1.65	0.32	87.47
K 61	Test new computer programs	19.67	2.35	0.46	87.93
H 53	Update systems programs (object run tape-sorts)	18.03	1.94	0.35	88.28
F 5	Compare data arithmetically with predetermined control totals	16.39	2.41	0.39	88.67
F 3	Check error with consultant, correct and resubmit	16.39	1.97	0.32	88.99
H 27	Operate time sharing system terminal	16.39	2.17	0.36	89.35
K 62	Test revised computer programs	16.39	2.14	0.35	89.70
F 1	Arrange reruns and special checks to proof final output	14.75	1.65	0.24	89.94
H 48	Splice paper tape	14.75	1.35	0.20	90.14
C 20	Plan and schedule work assignments for operators	14.75	1.55	0.23	90.37
F 11	Control basic input into manual data systems	13.11	1.63	0.21	90.58
F 10	Control basic input into automated data systems	13.11	2.94	0.39	90.97
F 7	Compute due-in and due-out dates for controlled reports	11.48	2.47	0.28	91.25
F 24	Perform assembly, rearragement, and spot edits	11.48	2.71	0.31	91.56
F 31	Read and interpret regulations, manuals, or administrative orders	11.48	1.73	0.20	91.76
C 34	Supervise data processing machine operators	11.48	1.92	0.22	91.98
A 9	Orient newly assigned data services personnel	11.48	1.87	0.21	92.19
C 12	Inform person of prime responsibility of repeated errors in input data	11.48	1.80	0.21	92.40
C 4	Coordinate scheduling of machine work load	11.48	1.96	0.23	92.63

TABLE 5 Task Job Description for Programmers (N=107)

Ranked by ..... PERCENT OF MEMBERS PERFORMING
AVERAGE PERCENT TIME SPENT BY MEMBERS PERFORMING
AVERAGE PERCENT TIME SPENT BY ALL MEMBERS
CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS

D-TSK	TASK TITLE				
K 25	Desk check or debug programs after assembly or compilation	93.46	4.47	4.17	4.17
K 39	Isolate and correct programming errors discovered during testing	89.72	4.14	3.72	7.89
K 61	Test new computer programs	86.92	3.96	3.45	11.34
K 9	Code routine computer programs	85.05	4.12	3.50	14.84
K 59	Revise computer programs	82.24	3.44	2.83	17.67
K 62	Test revised computer programs	79.44	3.34	2.66	20.33
K 26	Desk check programming logic for punching errors prior to assembly or compilation	78.50	2.99	2.35	22.68
K 52	Prepare documentation including formats and layouts for input and output media	78.50	3.10	2.44	25.12
K 65	Write programs for local one-time applications	77.57	2.98	2.31	27.43
K 45	Patch computer programs	76.64	2.64	2.03	29.46
K 37	Insert standard changes into existing programs	76.64	3.01	2.31	31.77
K 53	Prepare general and detailed flow charts	74.77	2.77	2.07	33.84
K 51	Prepare detail flow charts	70.09	2.65	1.86	35.70
K 4	Analyze programming documentation	65.42	2.16	1.42	37.12
K 21	Design report formats	64.49	2.27	1.46	38.58
K 35	Incorporate standard routines into programs	62.62	2.27	1.42	40.00
K 3	Analyze computer inputs prior to test run and follow-up	62.62	2.55	1.60	41.60
K 55	Prepare programming block diagrams	61.68	2.20	1.35	42.95
K 18	Design or lay out magnetic tape storage formats	57.94	2.01	1.16	44.11
K 41	Maintain and update library of programs and processing documentation	57.01	2.34	1.33	45.44
K 5	Audit computer inputs after test run and follow-up	55.14	2.47	1.36	46.80
K 49	Prepare console operator's run books	54.21	2.56	1.39	48.19
K 31	Develop subroutines	53.27	2.27	1.21	49.40
K 8	Code programs utilizing more than one language	53.27	2.78	1.48	50.88
K 56	Prepare testing instructions and control test data for use of console operator during test audits	52.34	2.88	1.51	52.39
K 60	Select appropriate utility programs	52.34	2.17	1.14	53.53
K 57	Recommend corrections or modifications to systems	50.47	1.74	0.88	54.41
K 12	Confer with functional area personnel to prepare specific program routines	48.60	2.71	1.31	55.72
K 34	Edit computer programs for effective use of memory	47.66	2.13	1.02	56.74
K 36	Incorporate utility routines into programs	47.66	1.92	0.91	57.65
K 2	Analyze applications to select appropriate utility programs and subroutines	47.66	1.86	0.89	58.54
K 16	Design or lay out disc storage formats	44.86	1.73	0.78	59.32
K 67	Write programs for the generation of data to be used for program testing	42.99	1.95	0.84	60.16
K 11	Code tape-sort programs	42.06	1.91	0.80	60.96
K 27	Determine most applicable programming language for problems	41.12	1.77	0.73	61.69
K 6	Catalogue data sets	41.12	2.27	0.94	62.63
K 30	Develop program logic charts for machine routines	40.19	2.15	0.86	63.49
K 43	Manually convert numbers from one number system to another	39.25	1.83	0.72	64.21
K 29	Develop operation procedures for programming	37.38	1.87	0.70	64.91
K 54	Prepare instructions for operation of on-line peripheral equipment	35.51	1.92	0.68	65.59

TABLE 5 continued

Ranked by .....PERCENT OF MEMBERS PERFORMING

D-TSK	TASK TITLE	PERCENT OF MEMBERS PERFORMING	AVERAGE PERCENT TIME SPENT BY MEMBERS PERFORMING	AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS
K 14	Design disk storage allocation	34.58	1.89	0.65	66.24
K 48	Perform systems analysis to meet requirements of company functions	32.71	2.27	0.74	66.98
K 13	Coordinate with system design personnel to prepare overall block diagrams	31.78	1.81	0.57	67.55
K 58	Review existing routines for applicability of new techniques	30.84	1.61	0.50	68.05
K 42	Maintain library of documentation of general purpose and utility programs	30.84	1.73	0.53	68.58
K 1	Adapt programs written in symbolic language to different computer configurations	29.91	2.16	0.65	69.23
K 50	Prepare control card sheets for utility or library programs	28.97	2.09	0.61	69.84
K 33	Edit computer programs for efficient use of logical and arithmetical components	27.10	1.92	0.52	70.36
H 20	Operate key punch machines or verifiers	27.10	1.40	0.38	70.74
K 10	Code software utility programs	26.17	1.97	0.51	71.25
K 28	Develop flow charts for handling source data by off-line support equipment	26.17	2.17	0.57	71.82
K 15	Design or lay out core storage formats	25.23	1.59	0.40	72.22
I 6	Write programs to print tapes, punch cards, or read cards	24.30	2.91	0.71	72.93
K 32	Edit computer programs for effective use of auxiliary storage media	22.43	1.51	0.34	73.27
F 13	Coordinate with operators, programmers, or systems personnel on matters of joint interest	21.50	1.47	0.32	73.59
D 7	Coordinate with operations on preparation of computer operating instructions	20.56	1.72	0.35	73.94
H 29	Perform compilation or assembly	19.63	1.40	0.27	74.21
K 24	Design tape or disk sort programs	19.63	1.93	0.38	74.59
K 44	Manually translate computer programs written in symbolic language into assembly language	18.69	2.87	0.54	75.13
A 2	Analyze data processed to make sure that desired information is obtained	18.69	1.93	0.36	75.49
K 38	Integrate planned routines with the overall programming systems (segmenting)	17.76	1.74	0.31	75.80
M 10	Design punched card media layouts	17.76	1.21	0.21	76.01
H 30	Perform debugging runs	17.76	1.42	0.25	76.26
H 13	Operate card reader	17.76	1.09	0.19	76.45
H 8	Maintain card files (source object, etc.)	17.76	2.19	0.39	76.84
F 1	Arrange reruns and special checks to proof final output	17.76	1.59	0.28	77.12
K 7	Code computer applications using a reports program generator	16.82	2.04	0.34	77.46
H 52	Update current source programs	16.82	1.63	0.27	77.73
M 22	Prepare systems block diagrams	16.82	0.98	0.16	77.89
N 10	Identify problem areas in the system	15.89	1.30	0.21	78.10
N 6	Evaluate file contents and sequences	15.89	1.25	0.20	78.30
K 23	Design tape input/output formulas	15.89	1.81	0.29	78.59
F 5	Compare data arithmetically with predetermined control	15.89	1.52	0.24	78.83
F 3	Check error with consultant, correct and resubmit	14.95	1.77	0.27	79.10
H 6	Load programs and data cards	14.95	1.24	0.18	79.28

TABLE 5 continued

D-TSK	TASK TITLE	CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	AVERAGE PERCENT TIME SPENT BY MEMBERS PERFORMING	PERCENT OF MEMBERS PERFORMING
	Ranked by	↓	↓	↓	↓
H 4	Determine cause of machine stops and malfunctions	14.95	1.18	0.18	79.46
H 21	Operate magnetic tape unit	14.95	0.82	0.12	79.58
H 15	Operate console	14.95	1.03	0.15	79.73
H 28	Perform card-to-printer operation	14.95	0.95	0.14	79.87
D 4	Coordinate programming requirements with machine configuration	14.95	1.59	0.24	80.11
D 25	Maintain instruction worksheets for operational programs	14.95	1.55	0.23	80.34
K 47	Perform real time programming	14.95	2.73	0.41	80.75
K 64	Write programs for inquiry routines	14.95	2.97	0.44	81.19
M 20	Prepare or analyze data for testing new systems	14.95	1.20	0.18	81.37
M 18	Prepare documentation for systems flow charts	14.02	0.98	0.14	81.51
N 4	Evaluate data for duplications and unnecessary requirements	14.02	0.95	0.13	81.64
M 13	Determine processing, storage, and retrieval techniques	14.02	1.55	0.22	81.86
D 23	Initiate procedures for preparation of input to computer	14.02	1.62	0.23	82.09
D 27	Orient newly assigned programmers	14.02	1.34	0.19	82.28
H 19	Operate interpreter	14.02	1.08	0.15	82.43
G 21	Perform program analysis	14.02	2.07	0.29	82.72
F 31	Read and interpret regulations, manuals, or administrative orders	14.02	1.49	0.21	82.93
H 26	Operate sorter	13.08	1.03	0.13	83.06
H 35	Perform tape-to-printer operation	13.08	1.01	0.13	83.19
D 15	Establish programming priorities	13.08	1.90	0.25	83.44
D 5	Coordinate with functional areas on programming aspects of new systems being devised	13.08	1.63	0.21	83.65
D 3	Coordinate flow of data from one report to another	13.08	1.27	0.17	83.82
D 6	Coordinate with functional areas on programming aspects of reports being developed	13.08	1.66	0.22	84.04
H 44	Select and mount tapes	13.08	1.01	0.13	84.17
N 5	Evaluate data for relationship of output to source documents	13.08	1.11	0.15	84.32
N 11	Identify source documents, internal files and final reports	13.08	1.02	0.13	84.45
L 8	Determine size and time-elements of processing runs	13.08	1.05	0.14	84.59
N 7	Evaluate problem areas adaptable to modifications	12.15	1.23	0.15	84.74
K 22	Design software utility programs	12.15	1.21	0.15	84.89
D 8	Coordinate with systems designers on programming aspects of new systems	12.15	1.42	0.17	85.06
H 38	Prepare special carriage control tapes	12.15	0.94	0.11	85.17
H 36	Prepare control decks	11.21	1.18	0.13	85.30
H 2	Analyze machine operation through use of messages received from the equipment	11.21	1.11	0.12	85.42
H 1	Analyze job steps to determine data recovery points	11.21	1.19	0.13	85.55
D 9	Coordinate with systems designers on programming aspects of reports being developed	11.21	2.32	0.26	85.81
D 13	Develop program test and maintenance systems	11.21	1.66	0.19	86.00
D 12	Develop programming aids	11.21	1.76	0.20	86.20
H 46	Set up computer for operation	11.21	0.98	0.11	86.31
A 18	Review machine run reports for accuracy	11.21	1.46	0.16	86.47
A 1	Analyze data processed for possible modification and combination of report	10.28	1.54	0.16	86.63

TABLE 5 continued

D-TSK	TASK TITLE	CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	AVERAGE PERCENT TIME SPENT BY MEMBERS PERFORMING	PERCENT OF MEMBERS PERFORMING
	Ranked by	↓	↓	↓	↓
H 43	Select and mount disks	10.28	1.01	0.10	86.73
D 22	Follow-up program being developed at local level	10.28	2.51	0.26	86.99
D 33	Supervise and edit documentation of programs	10.28	1.64	0.17	87.16
L 4	Coordinate with functional areas to determine output requirements	10.28	1.28	0.13	87.29
K 40	Lay out memory maps	9.35	1.33	0.12	87.41
L 17	Prepare computer logic diagrams	9.35	1.25	0.12	87.53
M 11	Design punched tape media layouts	9.35	1.20	0.11	87.64
M 14	Inspect system flow	9.35	1.32	0.12	87.76
E 5	Document new computer processes	9.35	1.48	0.14	87.90
D 14	Establish controls for program card decks and magnetic files	9.35	1.53	0.14	88.04
H 42	Screen reports, cards, or programs for obvious errors and initiate corrections	9.35	1.50	0.14	88.18
H 7	Locate tapes in storage media or tape library	9.35	0.94	0.09	88.27
H 40	Review processing steps before job is put on computer	9.35	1.46	0.14	88.41
G 1	Analyze programs, evaluations, reviews or reports for problem identification	9.35	2.61	0.24	88.65
F 30	Process requests for new or revised reports	9.35	1.27	0.12	88.77
C 7	Develop computer operating instructions	9.35	2.13	0.20	88.97
H 3	Analyze machine operation through use of conditions displayed	8.41	1.10	0.09	89.06
I 1	Design assembly programs	8.41	2.65	0.22	89.28
D 32	Schedule development of programs	8.41	1.41	0.12	89.40
D 31	Review detail flow charts prior to preparation of programs	8.41	1.59	0.13	89.53
D 29	Plan programming work loads, make work assignments, and organize shifts	8.41	2.35	0.20	89.73
M 3	Coordinate with programmers and functional areas to establish new applications	8.41	1.02	0.09	89.82
K 66	Write programs for remote data input	8.41	2.77	0.23	90.05
L 1	Brief functional area personnel on limits of data processing	8.41	0.74	0.06	90.11
L 18	Prepare detailed document flow diagrams	7.48	0.88	0.07	90.18
L 9	Develop standard elements and codes for functional areas	7.48	0.96	0.07	90.25
N 9	Identify data interface requirements	7.48	1.00	0.08	90.33
N 12	Perform initial analysis of requests for systems studies	7.48	0.98	0.07	90.40
M 23	Recommend changes in data automation proposals to persons of prime responsibility	7.48	1.29	0.10	90.50
D 11	Develop local operating procedures for programming	7.48	1.90	0.14	90.64
D 21	Evaluate work performance of programmers	7.48	3.24	0.24	90.88
D 1	Conduct on-the-job training in programming	7.48	1.66	0.12	91.00
C 28	Review completed programs for accuracy	7.48	2.04	0.15	91.15
H 32	Perform punched card-to-tape conversion operation	7.48	1.04	0.08	91.23
F 18	Maintain list of recurring reports	7.48	1.53	0.11	91.34
F 17	Maintain files of reports, regulation, or directives pertaining to data systems	7.48	1.43	0.11	91.45
F 2	Audit data systems or functional area reports	7.48	0.69	0.05	91.50
F 8	Contact functional areas for submission and evaluation of data	7.48	1.00	0.07	91.57

TABLE 6 Task Job Description for Systems Personnel (N=71)

Ranked by ..... PERCENT OF MEMBERS PERFORMING
AVERAGE PERCENT TIME SPENT BY MEMBERS PERFORMING
AVERAGE PERCENT TIME SPENT BY ALL MEMBERS
CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS

D-TSK	TASK TITLE				
K 61	Test new computer programs	61.97	2.21	1.37	1.37
K 25	Desk check or debug programs after assembly or compilation	61.97	2.91	1.80	3.17
K 59	Revise computer programs	57.75	1.88	1.08	4.25
K 39	Isolate and correct programming errors discovered during testing	56.34	2.77	1.56	5.81
K 62	Test revised computer programs	54.93	2.09	1.15	6.96
K 52	Prepare documentation including formats and layouts for input and output media	53.52	2.15	1.15	8.11
K 48	Perform systems analysis to meet requirements of company functions	52.11	1.64	0.86	8.97
M 18	Prepare documentation for systems flow charts	50.70	2.27	1.15	10.12
M 22	Prepare systems block diagrams	49.30	1.92	0.95	11.07
K 45	Patch computer programs	49.30	2.35	1.16	12.23
K 21	Design report formats	49.30	1.89	0.93	13.16
K 9	Code routine computer programs	49.30	2.80	1.38	14.54
K 53	Prepare general and detailed flow charts	47.89	1.88	0.90	15.44
N 10	Identify problem areas in the system	47.89	1.71	0.82	16.26
N 11	Identify source documents, internal files and final reports	46.48	2.35	1.09	17.35
K 26	Desk check programming logic for punching errors prior to assembly or compilation	46.48	1.56	0.73	18.08
N 12	Perform initial analysis of requests for systems studies	45.07	1.87	0.84	18.92
N 7	Evaluate problem areas adaptable to modifications	45.07	1.65	0.74	19.66
N 6	Evaluate file contents and sequences	45.07	1.48	0.67	20.33
N 5	Evaluate data for relationship of output to source documents	43.66	1.81	0.79	21.12
M 20	Prepare or analyze data for testing new systems	43.66	1.54	0.67	21.79
N 1	Define objectives of system studies	43.66	1.86	0.81	22.60
M 27	Study purpose and design or new systems	43.66	2.56	1.12	23.72
M 14	Inspect system flow	43.66	1.77	0.77	24.49
K 57	Recommend corrections or modifications to systems	43.66	1.15	0.50	24.99
K 65	Write programs for local one-time applications	43.66	1.32	0.57	25.56
K 4	Analyze programming documentation	43.66	2.11	0.92	26.48
M 3	Coordinate with programmers and functional areas to establish new applications	42.25	1.95	0.82	27.30
N 4	Evaluate data for duplications and unnecessary requirements	40.85	1.79	0.73	28.03
K 51	Prepare detail flow charts	40.85	1.50	0.61	28.64
A 1	Analyze data processed for possible modification and combination of report	40.85	1.03	0.42	29.06
A 2	Analyze data processed to make sure that desired information is obtained	40.85	1.32	0.54	29.60
K 18	Design or lay out magnetic tape storage formats	39.44	1.69	0.67	30.27
K 41	Maintain and update library of program and processing documentation	39.44	1.32	0.52	30.79
M 10	Design punched card media layouts	39.44	1.97	0.78	31.57
E 3	Coordinate with staff in the development of new systems	39.44	1.35	0.53	32.10
K 8	Code programs utilizing more than one language	38.03	1.47	0.56	32.66
F 13	Coordinate with operators, programmers, or systems personnel on matters of joint interest	38.03	1.42	0.54	33.20
M 13	Determine processing, storage, and retrieval techniques	38.03	1.47	0.56	33.76
K 55	Prepare programming block diagrams	38.03	1.94	0.74	34.50

TABLE 6 continued

D-TSK	TASK TITLE	PERCENT OF MEMBERS PERFORMING	AVERAGE PERCENT TIME SPENT BY MEMBERS PERFORMING	AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS
	Ranked by	↓	↓	↓	↓
K 37	Insert standard changes into existing programs	36.62	2.30	0.84	35.34
N 8	Evaluate utilization of output products	36.62	1.48	0.54	35.88
K 2	Analyze applications to select appropriate utility programs and subroutines	36.62	1.23	0.45	36.33
A 8	Inspect methods used to process data	36.62	1.19	0.44	36.77
E 2	Coordinate with programming supervisors in designing new programming systems	35.21	1.66	0.58	37.35
D 5	Develop directives pertaining to data systems	35.21	2.22	0.78	38.75
K 31	Develop subroutines	35.21	1.88	0.66	39.41
K 27	Determine most applicable programming language for problems	35.21	1.09	0.38	39.79
K 12	Confer with functional area personnel to prepare specific program routines	35.21	1.66	0.58	40.37
K 14	Design disk storage allocation	33.80	1.34	0.45	40.82
K 16	Design or lay out disk storage formats	33.80	1.22	0.41	41.23
L 4	Coordinate with functional areas to determine output requirements	33.80	1.26	0.43	41.66
L 1	Brief functional area personnel on limits of data processing	33.80	1.00	0.34	42.00
N 14	Prepare presentations on data systems operations	33.80	1.30	0.44	42.44
K 5	Audit computer inputs after test run and follow-up	33.80	1.41	0.48	42.92
K 3	Analyze computer inputs prior to test run and follow-up	33.80	1.63	0.55	43.47
E 5	Document new computer processes	32.39	1.68	0.54	44.01
N 13	Prepare decision charts	32.39	1.60	0.52	44.53
M 23	Recommend changes in data automation proposals to persons of prime responsibility	32.39	1.17	0.38	44.91
L 2	Coordinate integration of systems with functional areas	32.39	1.31	0.42	45.33
D 4	Coordinate programming requirements with machine configuration	30.99	1.21	0.38	45.71
D 7	Coordinate with operations on preparation of computer operating instructions	29.58	1.84	0.54	46.25
E 6	Establish standard data elements, codes, and names for systems design	29.58	1.33	0.39	46.64
L 7	Determine input/output characteristics and media for functional areas	29.58	0.85	0.25	46.89
K 60	Select appropriate utility programs	29.58	1.43	0.42	47.31
K 35	Incorporate standard routines into programs	29.58	1.31	0.39	47.70
K 49	Prepare console operator's run books	29.58	1.48	0.44	48.14
M 26	Review technological developments in processing, storage, and information retrieval	29.58	1.35	0.40	48.54
N 9	Identify data interface requirements	28.17	1.50	0.42	48.96
M 2	Control system input and output	28.17	1.41	0.40	49.36
L 18	Prepare detailed document flow diagrams	28.17	1.29	0.36	49.72
L 8	Determine size and time-elements of processing runs	28.17	0.82	0.23	49.95
K 34	Edit computer programs for effective use of memory	28.17	1.33	0.38	50.33
D 8	Coordinate with systems designers on programming aspects of new systems	28.17	2.33	0.66	50.99
D 6	Coordinate with functional areas on programming aspects of reports being developed	28.17	1.72	0.48	51.47
I 6	Write programs to print tapes, punch cards, or read cards	28.17	1.12	0.31	51.78
H 29	Perform compilation or assembly	28.17	1.11	0.31	52.09

TABLE 6 continued

D-TSK	TASK TITLE	PERCENT OF MEMBERS PERFORMING	AVERAGE PERCENT TIME SPENT BY MEMBERS PERFORMING	AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS
Ranked by		↓	↓	↓	↓
H 4	Determine cause of machine stops and malfunctions	28.17	1.25	0.35	52.44
E 9	Estimate systems analysis and design work requirement	26.76	1.28	0.34	52.78
E 7	Establish systems analysis and design priorities	26.76	1.48	0.40	53.18
G 1	Analyze programs, evaluations, reviews or reports for problem identification	26.76	1.26	0.34	53.52
K 30	Develop program logic charts for machine routines	26.76	1.63	0.44	53.96
K 13	Coordinate with system design personnel to prepare overall block diagrams	26.76	1.26	0.34	54.30
L 10	Evaluate present and proposed costs of input/output requirements	26.76	0.83	0.22	54.52
M 15	Monitor updating of format and data items	26.76	1.41	0.38	54.90
M 9	Design or modify systems to maximize integration of operations	26.76	1.34	0.36	55.26
C 7	Develop computer operating instructions	26.76	1.22	0.33	55.59
C 5	Coordinate with programmers and systems personnel on matters of joint interest	26.76	1.41	0.38	55.97
K 29	Develop operation procedures for programming	25.35	1.05	0.26	56.23
K 33	Edit computer programs for efficient use of logical and arithmetical components	25.35	1.16	0.29	56.52
L 3	Coordinate requirements study with programmers and equipment operators	25.35	0.91	0.23	56.75
H 30	Perform debugging runs	25.35	1.11	0.28	57.03
D 33	Supervise and edit documentation of programs	25.35	1.63	0.41	57.44
D 23	Initiate procedures for preparation of input to computer	23.94	1.10	0.26	57.70
H 20	Operate key punch machines or verifiers	23.94	0.56	0.14	57.84
G 21	Perform program analysis	23.94	1.25	0.30	58.14
E 22	Review requests for development of new systems	23.94	1.32	0.32	58.46
K 6	Catalogue data sets	23.94	1.29	0.31	58.77
K 67	Write programs for the generation of data to be used for program testing	23.94	0.77	0.19	58.96
M 7	Design or modify data interface requirements	23.94	1.45	0.35	59.31
M 6	Design or modify audit traits	23.94	1.79	0.43	59.74
L 17	Prepare computer logic diagrams	23.94	1.24	0.30	60.04
K 12	Evaluate use of existing systems or programs for pilot projects	23.94	0.89	0.21	60.25
C 2	Coordinate errors in programming logic with programmers	23.94	1.10	0.26	60.51
A 5	Coordinate work of data services unit with activities furnishing report data	23.94	1.20	0.29	60.80
A 3	Analyze functional area reports for format errors	22.54	0.65	0.15	60.95
A 9	Orient newly assigned data services personnel	22.54	0.98	0.22	61.17
C 3	Coordinate one time report requirements with person of prime responsibility	22.54	0.91	0.20	61.37
L 11	Evaluate present and proposed costs of processing, storage, and informational retrieval	22.54	0.75	0.17	61.54
M 1	Audit mechanized listings to check out systems	22.54	1.72	0.39	61.93
K 36	Incorporate utility routines into programs	22.54	1.11	0.25	62.18
K 43	Manually convert numbers from one number system to another	22.54	1.03	0.23	62.41
K 1	Adapt programs written in symbolic language to different computer configurations	22.54	1.44	0.32	62.73

TABLE 6 continued

Ranked by .....PERCENT OF MEMBERS PERFORMING

D-TSK	TASK TITLE	PERCENT OF MEMBERS PERFORMING	AVERAGE PERCENT TIME SPENT BY MEMBERS PERFORMING	AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS
H 52	Update current source programs	22.54	1.05	0.24	62.97
F 1	Arrange reruns and special checks to proof final output	22.54	0.90	0.20	63.17
G 11	Develop systems for collecting, processing, and storing data	22.54	1.54	0.35	63.52
F 29	Prepare recommendations for improved efficiency in operations	22.54	1.20	0.27	63.79
H 1	Analyze job steps to determine data recovery points	22.54	0.89	0.20	63.99
D 15	Establish programming priorities	22.54	1.57	0.35	64.34
D 28	Perform follow-up review of new systems	22.54	1.17	0.26	64.60
D 9	Coordinate with systems designers on programming aspects of reports being developed	22.54	2.36	0.53	65.13
D 3	Coordinate flow of data from one report to another	22.54	1.07	0.24	65.37
C 28	Review completed programs for accuracy	22.54	1.18	0.27	65.64
D 1	Conduct on-the-job training in programming	21.13	0.98	0.21	65.85
D 27	Orient newly assigned programmers	21.13	0.89	0.19	66.04
F 31	Read and interpret regulations, manuals, or administrative orders	21.13	1.28	0.27	66.31
E 11	Inspect systems analysis and design activities	21.13	2.20	0.47	66.78
I 1	Design assembly programs	21.13	2.01	0.43	67.21
K 10	Code software utility programs	21.13	1.67	0.35	67.56
K 11	Code tape sort programs	21.13	0.91	0.19	67.75
K 15	Design or lay out core storage formats	21.13	1.79	0.38	68.13
L 9	Develop standard elements and codes for functional areas	21.13	0.90	1.19	68.32
L 16	Plan functional integration of reports and systems	21.13	1.16	0.24	68.56
M 24	Review data automation proposals submitted by person of prime responsibility	21.13	1.12	0.24	68.80
M 25	Review technological developments in communications or teleprocessing requirements	19.72	1.42	0.28	69.08
L 19	Prepare feasibility study on present system to determine need for new system	19.72	1.07	0.21	69.29
M 5	Design data conversion systems to include input/output equipment	19.72	1.54	0.30	69.59
N 16	Provide systems consultative services to potential customers	19.72	1.41	0.28	69.87
K 58	Review existing routines for applicability of new techniques	19.72	0.91	0.18	70.05
K 56	Prepare testing instructions and control test data for use of console operator during test audits	19.72	1.18	0.23	70.28
K 32	Edit computer programs for effective use of auxiliary storage media	19.72	0.97	0.19	70.47
E 13	Orient newly assigned systems design and analysis personnel	19.72	1.30	0.26	70.73
D 32	Schedule development of programs	19.72	1.35	0.27	71.00
E 1	Control error correction reruns	19.72	0.78	0.15	71.15
D 12	Develop programming aids	19.72	1.19	0.23	71.38
H 13	Operate card reader	19.72	0.69	0.14	71.52
A 11	Monitor the meeting of deadlines	19.72	0.63	0.12	71.64
A 18	Review machine run reports for accuracy	18.31	1.26	0.23	71.87
H 21	Operate magnetic tape unit	18.31	0.53	0.10	71.97
H 15	Operate console	18.31	0.69	0.13	72.10
H 2	Analyze machine operation through use of messages received from the equipment	18.31	1.04	0.19	72.29

TABLE 6 continued

D-TSK	TASK TITLE	PERCENT OF MEMBERS PERFORMING	AVERAGE PERCENT TIME SPENT BY MEMBERS PERFORMING	AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS
	Ranked by	↓	↓	↓	↓
D 10	Design operating systems	18.31	1.48	0.27	72.56
D 22	Follow-up programs being developed at local level	18.31	1.42	0.26	72.82
K 24	Design tape or disk sort programs	18.31	1.02	0.19	73.01
M 12	Design systems to include tabular forms and visual displays	18.31	1.64	0.30	73.31
L 14	Investigate communications and teleprocessing requirements for integration of data systems and processing	18.31	1.32	0.24	73.55
M 11	Design punched tape media layouts	16.90	2.71	0.46	74.01
M 8	Design or modify feedback controls	16.90	1.11	0.19	74.20
M 21	Prepare statistical reports about data systems	16.90	1.21	0.21	74.41
M 19	Prepare manual data systems reports	16.90	1.81	0.31	74.72
K 28	Develop flow charts for handling source data by off-line support equipment	16.90	0.80	0.14	74.86
K 42	Maintain library of documentation of general purpose and utility programs	16.90	0.97	0.16	75.02
D 11	Develop local operating procedures for programming	16.90	1.14	0.19	75.21
D 21	Evaluate work performance of programmers	16.90	1.53	0.26	75.47
D 26	Maintain library of manuals, directives, or publications on computer programming	16.90	0.95	0.16	75.63
E 20	Prepare recommendations for needed data systems equipment	16.90	1.15	0.19	75.82
F 16	Extract figures needed for special analysis and studies	16.90	0.77	0.13	75.95
F 5	Compare data arithmetically with predetermined control totals	16.90	1.04	0.18	76.13
F 3	Check error with consultant, correct and resubmit	16.90	0.89	0.15	76.28
H 46	Set up computer for operation	16.90	0.54	0.09	76.37
C 8	Establish data automation production controls and standards	16.90	1.61	0.27	76.64
A 4	Conduct on-the-job training for data services personnel	15.49	1.00	0.15	76.79
H 44	Select and mount tapes	15.49	0.51	0.08	76.87
H 43	Select and mount disks	15.49	0.61	0.10	76.97
E 23	Supervise data systems analysis and design specialists	15.49	3.70	0.57	77.54
F 17	Maintain files of reports, regulation, or directives pertaining to data systems	15.49	0.84	0.13	77.67
E 14	Organize systems analysis design teams	15.49	0.96	0.15	77.82
D 29	Plan programming work loads, make work assignments, and organize shifts	15.49	1.69	0.26	78.08
E 4	Design presentations for staff viewing of computer systems utilization	15.49	1.03	0.16	78.24
C 24	Prepare recommendations for local operating instructions concerning programs	15.49	2.06	0.32	78.56
H 40	Review processing steps before job is put on computer	15.49	0.76	0.12	78.68
K 38	Integrate planned routines with the overall programming systems (segmenting)	15.49	1.02	0.16	78.84
K 23	Design tape input/output formulas	15.49	1.40	0.22	79.06
K 22	Design software utility programs	15.49	1.26	0.19	79.25
L 22	Supervise post-installation inspections of new systems	15.49	0.74	0.11	79.36
L 13	File and record characteristics and requirements for functional areas	14.08	0.76	0.11	79.47
N 18	Update and review schedules and program networks	14.08	1.26	0.18	79.65
L 5	Determine communications requirements of data-phone	14.08	2.11	0.30	79.95
H 26	Operate sorter	14.08	0.31	0.04	79.99

TABLE 6 continued

D-TSK	TASK TITLE	CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	AVERAGE PERCENT TIME SPENT BY MEMBERS PERFORMING	PERCENT OF MEMBERS PERFORMING
	Ranked by	↓	↓	↓	↓
H 5	Interrogate memory locations on the console	14.08	1.49	0.21	80.20
H 3	Analyze machine operation through use of conditions displayed	14.08	1.07	0.15	80.35
H 6	Load programs and data cards	14.08	0.84	0.12	80.47
G 23	Perform special studies or staff studies	14.08	1.36	0.19	80.66
C 23	Prepare recommendations for improved efficiency in automatic data processing equipment operations	14.08	1.70	0.24	80.90
C 13	Maintain operating manuals and directives affecting machine room function	14.08	0.81	0.11	81.01
D 31	Review detail flow charts prior to preparation of programs	14.08	1.05	0.15	81.16
D 24	Lead inspection or conversion teams	14.08	0.97	0.14	81.30
D 16	Establish run priorities for operations	14.08	0.68	0.10	81.40
E 10	Evaluate work performance of systems analysis and design personnel	14.08	1.12	0.16	81.56
F 30	Process requests for new or revised reports	14.08	0.92	0.13	81.69
F 27	Prepare data service forms	14.08	0.98	0.14	81.83
F 26	Prepare correspondence concerning data serivces	14.08	0.64	0.09	81.92
F 22	Operate office machines	14.08	0.78	0.11	82.03
F 2	Audit data systems or functional area reports	14.08	1.59	0.22	82.25
A 12	Notify person of prime responsibility of deadlines	14.08	0.90	0.13	82.38
A 6	Establish data services production controls and standards	14.08	1.75	0.25	82.63
C 12	Inform person of prime responsibility of repeated errors in input data	14.08	0.81	0.11	82.74
A 7	Evaluate work performance of data services personnel	12.68	1.39	0.18	82.92
E 17	Plan data systems analysis and design work loads	12.68	1.47	0.19	83.11
E 8	Establish systems analysis review schedules for existing systems	12.68	0.86	0.11	83.22
G 12	Develop uniform factors for improved planning and programming	12.68	1.03	0.13	83.35
D 14	Establish controls for program card decks and magnetic files	12.68	0.77	0.10	83.45
D 19	Evaluate programmers with respect to current techniques and methods	12.68	1.61	0.20	83.65
D 18	Evaluate proficiency of programming personnel to determine training needs	12.68	1.70	0.22	83.87
D 13	Develop program test and maintenance systems	12.68	0.99	0.13	84.00
G 19	Obtain samples of data for use in analysis work	12.68	1.46	0.18	84.18
H 36	Prepare control decks	12.68	0.87	0.11	84.29
I 5	Write programs to convert tapes from one computer to another	12.68	0.93	0.12	84.41
K 20	Design random access formulas	12.68	0.88	0.11	84.52
K 50	Prepare control card sheets for utility or library programs	12.68	1.82	0.23	84.75
K 47	Perform real time programming	12.68	2.01	0.25	85.00
K 54	Prepare instructions for operation of on-line peripheral equipment	12.68	0.69	0.09	85.09
N 15	Prepare grid and matrix charts of input, or output files	12.68	12.7	0.16	85.25
L 15	Investigate operating time of communications of teleprocessing requirements	12.68	1.12	0.14	85.39
M 28	Use factor analysis to design data systems	12.68	2.30	0.29	85.68

TABLE 6 continued

D-TSK	TASK TITLE	PERCENT OF MEMBERS PERFORMING	AVERAGE PERCENT TIME SPENT BY MEMBERS PERFORMING	AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS
	Ranked by	↓	↓	↓	↓
N 17	Schedule systems studies	11.27	1.20	0.14	85.82
K 44	Manually translate computer programs written in symbolic language into assembly language	11.27	1.10	0.12	85.94
I 4	Update systems monitor programs	11.27	14.30	1.61	87.55
K 7	Code computer applications using a reports program generator	11.27	0.67	0.08	87.63
J 20	Write programs for direct mathematical computations	11.27	1.65	0.19	87.82
G 22	Perform progress analysis	11.27	1.46	0.16	87.89
G 30	Prepare statistical summaries of data	11.27	1.39	0.16	88.14
G 17	Maintain data bank	11.27	1.02	0.11	88.25
H 8	Maintain card files (source object, etc.)	11.27	0.73	0.08	88.33
H 19	Operate interpreter	11.27	0.62	0.07	88.40
D 25	Maintain instruction worksheets for operational programs	11.27	0.82	0.09	88.49
D 35	Supervise programming specialists	11.27	1.12	0.13	88.62
C 22	Prepare operating instructions concerning local reports	11.27	0.88	0.10	88.72
G 6	Coordinate with electronic data processing services to receive computer products to assist management analysis	11.27	1.20	0.14	88.86
E 16	Plan and conduct on-the-job training for systems analysis and design personnel	11.27	1.31	0.15	89.01
E 21	Requisition systems development aids	11.27	0.99	0.11	89.12
E 19	Prepare in-house reports on personnel and systems design activities	11.27	1.21	0.14	89.26
F 6	Compile progress reports on data processed	11.27	0.83	0.09	89.35
B 4	Develop standards and factors for use in management control systems	11.27	1.17	0.13	89.48
B 3	Coordinate work of management analysis with staff sections and other activities	11.27	0.84	0.10	89.58
B 1	Brief supervisor and staff	11.27	1.33	0.15	89.73
B 8	Maintain library of manuals, directives or publications on management analysis	11.27	0.91	0.10	89.83
A 22	Supervise distribution of reports or programs	9.86	0.67	0.07	89.90
A 16	Plan facility modification	9.86	1.12	0.11	90.01
F 14	Develop data and documentation of accrued benefits resulting from installation of automatic data processing equipment	9.86	1.00	0.10	90.11
F 8	Contact functional areas for submission and evaluation of data	9.86	0.72	0.07	90.18
G 3	Calculate ratios, percentages, means or standard deviation from reported data	9.86	0.71	0.07	90.25
G 14	Evaluate programs for cost effectiveness	9.86	1.49	0.15	90.40
D 2	Coordinate explanation or error print-outs with machine configuration	9.86	1.10	0.11	90.51
H 7	Locate tapes in storage media or tape library	9.86	0.67	0.07	90.58
G 27	Prepare narrative reports showing results of analysis	9.86	1.68	0.17	90.75
H 28	Perform card-to-printer operation	9.86	0.29	0.03	90.78
I 7	Write systems monitor programs	9.86	2.44	0.24	91.02
K 64	Write programs for inquiry routines	9.86	2.28	0.22	91.24
K 63	Write console program manuals	9.86	0.79	0.08	91.32

TABLE 6 continued

Ranked by ..... PERCENT OF MEMBERS PERFORMING		AVERAGE PERCENT TIME SPENT BY MEMBERS PERFORMING	AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	
D-TSK	TASK TITLE				
M 31	Use queuing, gaming, or logical decision theories to design data systems	9.86	1.40	0.14	91.46
L 20	Prepare recommendations for size and capacity of proposed electronic data processing equipment	9.86	0.78	0.08	91.54
M 17	Prepare data automation proposals (DAP)	9.86	1.16	0.11	91.65

TABLE 7 Task Job Description for Managers (N=62)

Ranked by .....PERCENT OF MEMBERS PERFORMING

D-TSK	TASK TITLE	PERCENT OF MEMBERS PERFORMING	AVERAGE PERCENT TIME SPENT BY MEMBERS PERFORMING	AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS
C 12	Inform person of prime responsibility of repeated errors in input data	70.97	1.90	1.35	1.35
A 11	Monitor the meeting of deadlines	67.74	2.46	1.67	3.02
C 4	Coordinate scheduling of machine work load	66.13	2.33	1.54	4.56
C 23	Prepare recommendations for improved efficiency in automatic data processing equipment operations	66.13	1.63	1.08	5.64
C 3	Coordinate one time report requirements with person of prime responsibility	64.52	1.41	0.91	6.55
C 11	Evaluate work performance of operators	64.52	2.30	1.48	8.03
C 7	Develop computer operating instructions	62.90	1.75	1.10	9.13
C 5	Coordinate with programmers and systems personnel on matters of joint interest	62.90	1.80	1.13	10.26
A 8	Inspect methods used to process data	62.90	1.67	1.05	11.31
C 20	Plan and schedule work assignments for operators	62.90	2.32	1.46	12.77
A 12	Notify person of prime responsibility of deadlines	61.29	1.79	1.10	13.87
A 7	Evaluate work performance of data services personnel	59.68	2.18	1.30	15.17
A 15	Plan and schedule data services work assignments	59.68	2.05	1.22	16.39
C 15	Monitor the maintenance of utilization logs on automatic data processing equipment	58.06	1.97	1.15	17.54
C 34	Supervise data processing machine operators	58.06	3.12	1.81	19.35
C 2	Coordinate errors in programming logic with programmers	56.45	1.01	0.57	19.92
A 1	Analyze data processed for possible modification and combination of report	54.84	1.09	0.60	20.52
A 2	Analyze data processed to make sure that desired information is obtained	54.84	1.46	0.80	21.32
C 19	Plan and schedule duty assignments for data automation activity	54.84	2.31	1.27	22.59
C 13	Maintain operating manuals and directives affecting machine room function	53.23	1.64	0.87	23.46
C 22	Prepare operating instructions concerning local reports	53.23	1.77	0.94	24.40
C 30	Schedule basic input into automated data systems	53.23	1.62	0.86	25.26
A 5	Coordinate work of data services unit with activities furnishing report data	51.61	1.80	0.93	26.19
A 22	Supervise distribution of reports or programs	51.61	1.76	0.91	27.10
A 18	Review machine run reports for accuracy	50.00	1.98	0.99	28.09
A 9	Orient newly assigned data services personnel	50.00	1.55	0.78	28.87
A 13	Order data automation supplies and equipment	50.00	1.50	0.75	29.62
C 33	Supervise apprentice data processing machine operators	50.00	2.54	1.27	30.89
C 18	Plan and conduct on-the-job training in data processing procedures	50.00	2.10	1.05	31.94
C 17	Plan and conduct on-the-job training in data processing equipment operation	50.00	2.19	1.10	33.04
F 13	Coordinate with operators, programmers, or systems personnel on matters of joint interest	50.00	1.41	0.70	33.74
C 32	Schedule machine inspection and repair	48.39	1.86	0.90	34.64
A 6	Establish data services production controls and standards	48.39	1.40	0.68	35.32
A 23	Supervise operation of punched card or tape filing systems	48.39	1.58	0.76	36.08
C 1	Control tape utilization and assignment	48.39	1.61	0.78	36.86
C 8	Establish data automation production controls and standards	46.77	1.50	0.70	37.56

TABLE 7 continued

Ranked by ..... PERCENT OF MEMBERS PERFORMING → AVERAGE PERCENT TIME SPENT BY MEMBERS PERFORMING → AVERAGE PERCENT TIME SPENT BY ALL MEMBERS → CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS

D-TSK	TASK TITLE				
A 16	Plan facility modification	46.77	1.34	0.62	38.18
A 4	Conduct on-the-job training for data services personnel	46.77	1.55	0.72	38.90
C 24	Prepare recommendations for local operating instructions concerning programs	46.77	1.67	0.78	39.68
C 16	Perform periodic inspections of data automation activities	41.94	1.49	0.62	40.30
C 10	Evaluate performance history on specific jobs	41.94	1.41	0.59	40.89
A 19	Schedule input from person of prime responsibility	40.32	1.76	0.71	41.60
C 27	Requisition supplies	40.32	1.40	0.56	42.16
C 31	Schedule basic input into manual data systems	40.32	1.52	0.61	42.77
C 35	Supervise data processing machine supervisors	40.32	2.71	1.09	43.86
F 1	Arrange reruns and special checks to proof final output	40.32	1.11	0.45	44.31
F 32	Schedule computer runs for several days or more in advance	38.71	1.32	0.51	44.82
H 4	Determine cause of machine stops and malfunctions	38.71	1.31	0.51	45.33
A 14	Perform automatic data processing equipment financial planning	38.71	2.05	0.79	46.12
C 9	Evaluate office of prime responsibility equipment utilization and maintenance	37.10	1.79	0.66	46.78
F 31	Read and interpret regulations, manuals, or administrative orders	37.10	1.34	0.50	47.28
F 29	Prepare recommendations for improved efficiency in operations	35.48	1.04	0.37	47.65
C 28	Review completed programs for accuracy	35.48	1.39	0.49	48.14
C 6	Design system of magnetic tape management	35.48	1.51	0.54	48.68
A 17	Prepare or audit personnel records	35.48	1.39	0.49	49.17
D 16	Establish run priorities for operations	33.87	1.43	0.48	49.65
H 40	Review processing steps before job is put on computer	33.87	1.11	0.38	50.03
H 6	Load programs and data cards	32.26	1.20	0.39	50.42
H 10	Maintain levels of data processing supplies	32.26	0.91	0.29	50.71
C 26	Requisition auxiliary data processing equipment such as decollators or forms bursters	32.26	1.10	0.36	51.07
C 21	Prepare cost reports and cost estimates for data automation equipment	32.26	1.17	0.38	51.45
B 1	Brief supervisor and staff	32.26	1.85	0.60	52.05
A 10	Maintain training records for data services personnel	32.26	1.14	0.37	52.42
A 21	Supervise data services specialists	30.65	2.17	0.66	53.08
H 38	Prepare special carriage control tapes	30.65	0.81	0.25	53.33
F 12	Coordinate production control schedules	30.65	1.27	0.39	53.72
H 42	Screen reports, cards, or programs for obvious errors and initiate corrections	30.65	1.18	0.36	54.08
H 46	Set up computer for operation	29.03	0.95	0.28	54.36
F 10	Control basic input into automated data systems	29.03	1.23	0.36	54.72
H 41	Schedule sequence of users during shift for effective organization of runs	29.03	1.43	0.42	55.14
H 30	Perform debugging runs	29.03	0.93	0.27	55.41
H 29	Perform compilation or assembly	29.03	0.82	0.24	55.65
H 15	Operate console	29.03	0.94	0.27	55.92
H 3	Analyze machine operation through use of conditions displayed	29.03	1.13	0.33	56.25

TABLE 7 continued

Ranked by .....PERCENT OF MEMBERS PERFORMING

D-TSK	TASK TITLE	PERCENT OF MEMBERS PERFORMING	AVERAGE PERCENT TIME SPENT BY MEMBERS PERFORMING	AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS
H 2	Analyze machine operation through use of messages received from the equipment	29.03	0.99	0.29	56.54
E 3	Coordinate with staff in the development of new systems	27.42	1.72	0.47	57.47
C 14	Maintain training records on operators	27.42	1.72	0.47	57.47
H 9	Maintain current run tapes	27.42	1.06	0.29	57.76
H 7	Locate tapes in storage media or tape library	27.42	0.94	0.26	58.02
H 1	Analyze job steps to determine data recovery points	27.42	0.89	0.24	58.26
H 13	Operate card reader	27.42	0.95	0.26	58.52
H 21	Operate magnetic tape unit	27.42	0.77	0.21	58.73
H 44	Select and mount tapes	27.42	0.82	0.23	58.96
H 20	Operate key punch machines or verifiers	25.81	0.51	0.13	59.09
H 11	Maintain technical files on equipment operation and procedural changes	25.81	0.88	0.23	59.32
H 28	Perform card-to-printer operation	25.81	0.82	0.21	59.53
C 25	Prepare shift reports	25.81	1.82	0.47	60.00
F 5	Compare data arithmetically with predetermined control totals	25.81	1.35	0.35	60.35
F 3	Check error with consultant, correct and resubmit	25.81	1.10	0.28	60.63
F 30	Process requests for new or revised reports	25.81	0.91	0.24	60.87
F 18	Maintain list of recurring reports	24.19	0.87	0.21	61.08
F 17	Maintain files of reports, regulation, or directives pertaining to data systems	24.19	0.99	0.24	61.32
F 7	Compute due-in and due-out dates for controlled reports	24.19	0.75	0.18	61.50
F 11	Control basic input into manual data systems	24.19	1.27	0.31	61.81
D 23	Initiate procedures for preparation of input to computer	24.19	1.15	0.28	62.09
H 26	Operate sorter	24.19	0.79	0.19	62.28
H 36	Prepare control decks	24.19	0.90	0.22	62.50
H 12	Make switch settings	24.19	0.73	0.18	62.68
H 16	Operate decollator	24.19	0.59	0.14	62.82
H 43	Select and mount disks	24.19	0.83	0.20	63.02
A 20	Serve on inspection teams to evaluate other data systems units	24.19	1.41	0.34	63.36
B 5	Establish management analysis job priorities	24.19	2.20	0.53	63.89
A 3	Analyze functional area reports for format errors	22.58	1.14	0.26	64.15
H 14	Operate collator	22.58	0.77	0.17	64.32
H 19	Operate interpreter	22.58	0.68	0.15	64.47
H 35	Perform tape-to-printer operation	22.58	1.02	0.23	64.70
H 31	Perform operator maintenance on automatic data processing equipment	22.58	0.62	0.14	64.84
H 8	Maintain card files (source object, etc.)	22.58	1.12	0.25	65.09
D 15	Establish programming priorities	22.58	1.71	0.39	65.48
D 28	Perform follow-up review of new systems	22.58	1.09	0.25	65.73
C 29	Review or prepare cost estimates of equipment utilization	22.58	1.17	0.26	65.99
D 5	Coordinate with functional areas on programming aspects of new systems being devised	22.58	1.29	0.29	66.28
D 3	Coordinate flow of data from one report to another	22.58	0.98	0.22	66.50
F 2	Audit data systems or functional area reports	22.58	0.86	0.19	66.69
F 28	Prepare operational briefings	22.58	0.80	0.18	66.87
F 22	Operate office machines	22.58	0.77	0.17	67.04

TABLE 7 continued

D-TSK	TASK TITLE	PERCENT OF MEMBERS PERFORMING	AVERAGE PERCENT TIME SPENT BY MEMBERS PERFORMING	AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS
	Ranked by	↓	↓	↓	↓
N 10	Identify problem areas in the system	22.58	0.90	0.20	67.24
M 23	Recommend changes in data automation proposals to persons of prime responbility	22.58	1.00	0.23	67.47
K 61	Test new computer programs	22.58	0.86	0.19	67.66
K 57	Recommend corrections or modifications to systems	22.58	0.99	0.22	67.88
K 62	Test revised computer programs	20.97	1.02	0.21	68.09
L 2	Coordinate integration of systems with functional areas	20.97	1.44	0.30	68.39
M 24	Review data automation proposals submitted by person of prime responsibility	20.97	1.01	0.21	68.60
F 16	Extract figures needed for special analysis and studies	20.97	0.79	0.17	68.77
F 6	Compile progress reports on data processed	20.97	0.84	0.18	68.95
E 1	Control error correction reruns	20.97	0.94	0.20	69.15
D 21	Evaluate work performance of programmers	20.97	1.49	0.31	69.46
H 33	Perform tape-to-card conversion operation	20.97	0.69	0.14	69.60
H 32	Perform punched card-to-tape conversion operation	20.97	0.74	0.16	69.76
H 18	Operate forms bursting equipment	20.97	0.58	0.12	69.88
H 55	Wire reproducer control panels	20.97	0.91	0.19	70.07
H 54	Wire control panels	20.97	0.89	0.19	70.26
H 50	Strip tape and add new load point	20.97	0.60	0.12	70.38
K 4	Analyze programming documentation	20.97	0.91	0.19	70.57
B 3	Coordinate work of management analysis with staff sections and other activities	20.97	2.12	0.44	71.01
H 52	Update current source programs	19.35	0.94	0.18	71.19
H 25	Operate reproducer	19.35	0.74	0.14	71.33
H 39	Record time log for unscheduled maintenance	19.35	0.81	0.16	71.49
H 5	Interrogate memory locations on the console	19.35	0.76	0.15	71.64
D 14	Establish controls for program card decks and magnetic files	19.35	0.91	0.18	71.82
D 35	Supervise programming specialists	19.35	2.09	0.40	72.22
D 9	Coordinate with systems designers on programming aspects of reports being developed	19.35	1.16	0.22	72.44
F 9	Control automatic data processing equipment and data processing equipment orders	19.35	0.84	0.16	72.60
F 8	Contact functional areas for submission and evaluation of data	19.35	0.84	0.16	72.76
E 7	Establish systems analysis and design priorities	19.35	1.50	0.29	73.05
M 14	Inspect system flow	19.35	0.82	0.16	73.21
M 13	Determine processing, storage, and retrieval techniques	19.35	0.99	0.19	73.40
M 3	Coordinate with programmers and functional areas to establish new applications	19.35	0.87	0.17	73.57
K 59	Revise computer programs	19.35	1.06	0.20	73.77
K 52	Prepare documentation including formats and layouts for input and output media	19.35	0.99	0.19	73.96
K 39	Isolate and correct programming errors discovered during testing	19.35	1.18	0.23	74.19
K 49	Prepare console operator's run books	17.74	0.57	0.10	74.29
K 45	Patch computer programs	17.74	1.14	0.20	74.49

TABLE 7 continued

D-TSK	TASK TITLE	PERCENT OF MEMBERS PERFORMING	AVERAGE PERCENT TIME SPENT BY MEMBERS PERFORMING	AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS
	Ranked by	↓	↓	↓	↓
L 1	Brief functional area personnel on limits of data processing	17.74	0.72	0.13	74.62
K 65	Write programs for local one-time applications	17.74	0.96	0.17	74.79
K 25	Desk check or debug programs after assembly or compilation	17.74	1.28	0.23	75.02
L 22	Supervise post-installation inspections of new systems	17.74	1.21	0.21	75.23
E 9	Estimate systems analysis and design work requirement	17.74	1.06	0.19	75.42
E 20	Prepare recommendations for needed data systems equipment	17.74	1.33	0.24	75.66
E 23	Supervise data systems analysis and design specialists	17.74	1.58	0.28	75.94
F 26	Prepare correspondence concerning data services	17.74	0.93	0.17	76.11
D 7	Coordinate with operations on preparation of computer operating instructions	17.74	1.17	0.21	76.32
D 6	Coordinate with functional areas on programming aspects of reports being developed	17.74	1.33	0.24	76.56
D 4	Coordinate programming requirements with machine configuration	17.74	1.19	0.21	76.77
D 29	Plan programming work loads, make work assignments, and organize shifts	17.74	1.70	0.30	77.07
D 27	Orient newly assigned programmers	17.74	0.82	0.15	77.22
E 5	Document new computer processes	17.74	1.14	0.20	77.42
E 2	Coordinate with programming supervisors in designing new programming systems	17.74	1.15	0.20	77.62
D 33	Supervise and edit documentation of programs	17.74	1.11	0.20	77.82
D 19	Evaluate programmers with respect to current techniques and methods	17.74	1.49	0.26	78.08
D 18	Evaluate proficiency of programming personnel to determine training needs	17.74	1.29	0.23	78.31
D 10	Design operating systems	17.74	1.54	0.27	78.58
K 9	Code routine computer programs	17.74	1.06	0.19	78.77
B 7	Inspect subordinates' method of analyzing management data	17.74	1.28	0.23	79.00
B 10	Orient newly assigned management analysis personnel	16.13	1.21	0.20	79.20
B 4	Develop standards and factors for use in management control systems	16.13	1.24	0.20	79.40
H 47	Splice magnetic tape and leaders	16.13	0.65	0.10	79.50
D 11	Develop local operating procedures for programming	16.13	1.47	0.24	79.74
D 32	Schedule development of programs	16.13	1.34	0.22	79.96
D 8	Coordinate with systems designers on programming aspects of new systems	16.13	2.03	0.33	80.29
F 15	Evaluate and dispose of administrative records	16.13	0.71	0.11	80.40
F 21	Notify office of prime responsibility of new or revised reporting requirements	16.13	0.78	0.13	80.53
E 11	Inspect systems analysis and design activities	16.13	0.99	0.16	80.69
L 10	Evaluate present and proposed costs of input/output requirements	16.13	0.96	0.16	80.85
M 10	Design punched card media layouts	16.13	0.41	0.07	80.92
M 17	Prepare data automation proposals (DAP)	16.13	0.87	0.14	81.06
M 9	Design or modify systems to maximize integration of operations	16.13	0.78	0.13	81.19

TABLE 7 continued

D-TSK	TASK TITLE	Ranked by ..... PERCENT OF MEMBERS PERFORMING	AVERAGE PERCENT TIME SPENT BY MEMBERS PERFORMING	AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS
M 27	Study purpose and design or new systems	16.13	1.05	0.17	81.36
N 7	Evaluate problem areas adaptable to modifications	16.13	0.91	0.15	81.51
N 4	Evaluate data for duplications and unnecessary requirements	16.13	0.85	0.14	81.65
K 21	Design report formats	16.13	1.02	0.17	81.82
K 18	Design or lay out magnetic tape storage formats	16.13	0.90	0.15	81.97
K 53	Prepare general and detailed flow charts	16.13	0.71	0.11	82.08
K 37	Insert standard changes into existing programs	16.13	1.22	0.20	82.28
K 31	Develop subroutines	16.13	0.88	0.14	82.42
K 36	Incorporate utility routines into programs	14.52	0.86	0.12	82.54
K 35	Incorporate standard routines into programs	14.52	1.05	0.15	82.69
K 48	Perform systems analysis to meet requirements of company functions	14.52	1.56	0.23	82.92
K 58	Review existing routines for applicability of new techniques	14.52	0.93	0.13	83.05
K 60	Select appropriate utility programs	14.52	0.70	0.10	83.15
N 8	Evaluate utilization of output products	14.52	0.86	0.13	83.28
M 22	Prepare systems block diagrams	14.52	0.66	0.10	83.38
N 1	Define objectives of systems studies	14.52	1.64	0.24	83.62
M 18	Prepare documentation for systems flow charts	14.52	0.86	0.12	83.74
L 19	Prepare feasibility study on present system to determine need for new systems	14.52	0.99	0.14	83.88
E 10	Evaluate work performance of systems analysis and design personnel	14.52	1.10	0.16	84.04
E 15	Perform large scale computer scheduling	14.52	1.31	0.19	84.23
F 24	Perform assembly, rearrangement, and spot edits	14.52	0.70	0.10	84.33
E 22	Review requests for development of new systems	14.52	1.19	0.17	84.50
F 14	Develop data and documentation of accrued benefits resulting from installation of automatic data processing equipment	14.52	0.83	0.12	84.62
D 22	Follow-up programs being developed at local level	14.52	0.92	0.13	84.75
K 5	Audit computer inputs after test run and follow-up	14.52	0.87	0.13	84.88
K 3	Analyze computer inputs prior to test run and follow-up	14.52	0.85	0.12	85.00
G 35	Review operating cost data	14.52	1.53	0.22	85.22
H 22	Operate paper tape punch and reader	12.90	0.87	0.11	85.33
K 8	Code programs utilizing more than one language	12.90	1.47	0.19	85.52
K 2	Analyze applications to select appropriate utility programs and subroutines	12.90	0.60	0.08	85.60
D 1	Conduct on-the-job training in programming	12.90	0.89	0.12	85.72
D 26	Maintain library of manuals, directives, or publications on computer programming	12.90	0.82	0.11	85.83
F 23	Perform annual reports survey	12.90	0.46	0.06	85.89
L 11	Evaluate present and proposed costs of processing, storage and informational retrieval	12.90	1.02	0.13	86.02
L 20	Prepare recommendations for size and capacity of proposed electronic data processing equipment	12.90	0.92	0.12	86.14
N 17	Schedule systems studies	12.90	0.91	0.12	86.26
N 12	Perform initial analysis of requests for systems studies	12.90	1.06	0.14	86.40
L 3	Coordinate requirements study with programmers and equipment operators	12.90	0.63	0.08	86.48

TABLE 7 continued

D-TSK	TASK TITLE	PERCENT OF MEMBERS PERFORMING	AVERAGE PERCENT TIME SPENT BY MEMBERS PERFORMING	AVERAGE PERCENT TIME SPENT BY ALL MEMBERS	CUMULATIVE SUM OF AVERAGE PERCENT TIME SPENT BY ALL MEMBERS
	Ranked by	↓	↓	↓	↓
L 4	Coordinate with functional areas to determine output requirements	12.90	0.70	0.09	86.57
K 51	Prepare detail flow charts	12.90	0.58	0.08	86.65
K 41	Maintain and update library of program and processing	12.90	0.82	0.11	86.76
K 26	Desk check programming logic for punching errors prior to assembly or compilation	12.90	1.06	0.14	86.90
A 24	Supervise the maintenance of publications and reports	12.90	1.36	0.18	87.08
B 12	Plan management analysis personnel requirements	11.29	1.71	0.19	87.27
B 6	Evaluate work performance of management analysis personnel	11.29	2.42	0.27	87.54
B 15	Supervise clerks, typists or illustrators	11.29	1.15	0.13	87.67
B 14	Supervise administration of management control system	11.29	1.95	0.22	87.89
K 24	Design tape or disk sort programs	11.29	0.98	0.11	88.00
K 11	Code tape sort programs	11.29	0.96	0.11	88.11
K 34	Edit computer programs for effective use of memory	11.29	1.22	0.14	88.25
K 30	Develop program logic charts for machine routines	11.29	0.64	0.07	88.32
L 7	Determine input-output characteristics and media for functional areas	11.29	0.65	0.07	88.39
N 18	Update and review schedules and program networks	11.29	0.83	0.09	88.48
N 6	Evaluate file contents and sequences	11.29	0.78	0.09	88.57
K 12	Confer with functional area personnel to prepare specific program routines	11.29	0.85	0.10	88.67
M 11	Design punched tape media layouts	11.29	0.51	0.06	88.73
F 27	Prepare data service forms	11.29	0.57	0.06	88.79
E 17	Plan data systems analysis and design work loads	11.29	0.85	0.10	88.89
E 13	Orient newly assigned systems design and analysis personnel	11.29	0.60	0.07	88.96
E 8	Establish systems analysis review schedules for existing systems	11.29	0.95	0.11	89.07
G 1	Analyze programs, evaluations, reviews or reports for problem identification	11.29	1.25	0.14	89.21
G 14	Evaluate programs for cost effectiveness	11.29	0.68	0.08	89.29
E 4	Design presentations for staff viewing of computer systems utilization	11.29	1.40	0.16	89.45
D 34	Supervise apprentice programming specialists	11.29	1.35	0.15	89.60
D 2	Coordinate explanation or error print-outs with machine configuration	11.29	0.71	0.08	89.68
D 25	Maintain instruction worksheets for operational programs	11.29	0.67	0.08	89.76
D 24	Lead inspection or conversion teams	11.29	1.59	0.18	89.94
D 13	Develop program test and maintenance systems	11.29	0.78	0.09	90.03
D 12	Develop programming aids	11.29	2.00	0.23	90.26
I 6	Write programs to print tapes, punch cards, or read cards	11.29	0.80	0.09	90.35
G 26	Prepare upper management briefings	11.29	2.43	0.27	90.62
G 23	Perform special studies or staff studies	11.29	1.05	0.12	90.74

TABLE 8 Description of the Differences in the Percent of Data Converting Operators and the Percent of Computer Console Operators Performing the Same Tasks

GROUP 1 = COMPUTER CONSOLE OPERATORS
GROUP 2 - DATA CONVERTING OPERATORS

D-TSK	TASK TITLE	PERCENT PERFORMING, GROUP 1	PERCENT PERFORMING, GROUP 2	DIFFERENCE IN PERCENT PERFORMING GROUP 2 MINUS GROUP 1
H 6	Load programs and data cards	91.67	4.35	-87.32
H 15	Operate console	88.33	4.35	-83.99
H 46	Set up computer for operation	83.33	4.35	-78.99
H 44	Select and mount tapes	83.33	4.35	-78.99
H 35	Perform tape-to-printer operation	80.00	2.17	-77.83
H 43	Select and mount disks	83.33	6.52	-76.81
H 13	Operate card reader	85.00	8.70	-76.30
H 28	Perform card-to-printer operation	80.00	4.35	-75.65
H 7	Locate tapes in storage media or tape library	80.00	4.35	-75.65
H 40	Review processing steps before job is put on computer	76.67	4.35	-72.32
H 38	Prepare special carriage control tapes	73.33	2.17	-71.17
H 32	Perform punched card-to-tape conversion operation	73.33	2.17	-71.16
H 29	Perform compilation or assembly	76.67	6.52	-70.14
H 4	Determine cause of machine stops and malfunctions	88.33	23.91	-64.42
H 33	Perform tape-to-card conversion operation	60.00	2.17	-57.83
H 9	Maintain current run tapes	61.67	4.35	-57.32
H 39	Record time log for unscheduled maintenance	55.00	0.00	-55.00
H 2	Analyze machine operation through use of messages received from the equipment	76.67	21.74	-54.93
H 8	Maintain card files (source object, etc.)	63.33	8.70	-54.64
H 16	Operate decollator	53.33	2.17	-51.16
H 21	Operate magnetic tape unit	78.33	28.26	-50.07
H 31	Perform operator maintenance on automatic data processing equipment	71.67	21.74	-49.93
H 30	Perform debugging runs	53.33	4.35	-48.99
H 12	Make switch settings	61.67	13.04	-48.62
H 42	Screen reports, cards, or programs for obvious errors and initiate corrections	66.67	19.57	-47.10
H 18	Operate forms bursting equipment	50.00	4.35	-45.65
H 36	Prepare control decks	45.00	0.00	-45.00
H 3	Analyze machine operation through use of conditions displayed	65.00	21.74	-43.26
H 10	Maintain levels of data processing supplies	51.67	8.70	-42.97
H 5	Interrogate memory locations on the console	45.00	2.17	-42.83
H 1	Analyze job steps to determine data recovery points	61.67	19.57	-42.10
H 26	Operate sorter	65.00	23.91	-41.09
H 50	Strip tape and add new load point	45.00	4.35	-40.65
H 47	Splice magnetic tape and leaders	36.67	2.17	-34.49
H 55	Wire reproducer control panels	35.00	2.17	-32.83
H 41	Schedule sequence of users during shift for effective organization of runs	35.00	2.17	-32.83
H 25	Operate reproducer	46.67	15.22	-31.45
H 11	Maintain technical files on equipment operation and procedural changes	33.33	2.17	-31.16
H 14	Operate collator	45.00	15.22	-29.78
H 54	Wire control panels	38.33	8.70	-29.64
H 45	Select subroutines to accomplish jobs recieved for processing	28.33	0.00	-28.33

TABLE 8 continued

GROUP 1 = COMPUTER CONSOLE OPERATORS
GROUP 2 - DATA CONVERTING OPERATORS

D-TSK	TASK TITLE	PERCENT PERFORMING, GROUP 1	PERCENT PERFORMING, GROUP 2	DIFFERENCE IN PERCENT PERFORMING GROUP 2 MINUS GROUP 1
H 17	Operate document writer	28.33	0.00	-28.33
H 37	Prepare service action requests	28.33	2.17	-26.16
H 52	Update current source programs	30.00	6.52	-23.48
H 23	Operate punched care accounting machines	25.00	2.17	-22.83
H 19	Operate interpreter	56.67	34.78	-21.88
H 49	Set up punched card accounting machines for operation	21.67	0.00	-21.67
H 24	Operate remote terminals	23.33	2.17	-21.16
**********	TASKS OMITTED WHERE DIFFERENCES IN PERCENT PERFORMING = -20.00 THROUGH 20.00	**********	**********	**********
F 27	Prepare data service forms	5.00	17.39	12.39
F 16	Extract figures needed for special analysis and studies	6.67	19.57	12.90
M 20	Prepare or analyze data for testing new systems	0.00	13.04	13.04
F 4	Code functional area reports	0.00	17.39	17.39

TABLE 9 Description of the Differences in the Percent of Programmers and the Percent of Computer Console Operators Performing the Same Tasks

GROUP 1 = COMPUTER CONSOLE OPERATOR
GROUP 2 = PROGRAMMERS

D-TSK	TASK TITLE	PERCENT PERFORMING, GROUP 1	PERCENT PERFORMING, GROUP 2	DIFFERENCE IN PERCENT PERFORMING GROUP 2 MINUS GROUP 1
H 6	Load programs and data cards	91.67	13.83	-77.84
H 4	Determine cause of machine stops and malfunctions	88.33	13.83	-74.50
H 15	Operate console	88.33	13.83	-74.50
H 46	Set up computer for operation	83.33	10.64	-72.70
H 43	Select and mount disks	83.33	10.64	-72.70
H 7	Locate tapes in storage media or tape library	80.00	7.45	-72.55
H 44	Select and mount tapes	83.33	11.70	-71.63
H 31	Perform operator maintenance on automatic data processing equipment	71.67	2.13	-69.54
H 35	Perform tape-to-printer operation	80.00	11.70	-68.30
H 13	Operate card reader	85.00	17.02	-67.98
H 40	Review processing steps before job is put on computer	76.67	9.57	-67.09
H 2	Analyze machine operation through use of messages received from the equipment	76.67	9.57	-67.09
H 32	Perform punched card-to-tape conversion operation	73.33	6.38	-66.95
H 28	Perform card-to-printer operation	80.00	14.89	-65.11
H 21	Operate magnetic tape unit	78.33	13.83	-64.50
H 38	Prepare special carriage control tapes	73.33	11.70	-61.63
H 3	Analyze machine operation through use of conditions displayed	65.00	6.38	-58.62
H 12	Make switch settings	61.67	3.19	-58.48
H 42	Screen reports, cards, or programs for obvious errors and initiate corrections	66.67	8.51	058.16
H 29	Perform compilation or assembly	76.67	19.15	-57.52
H 33	Perform tape-to-card conversion operation	60.00	3.19	-56.81
H 9	Maintain current run tapes	61.67	5.32	-56.35
H 39	Record time log for unscheduled maintenance	55.00	1.06	-53.94
H 26	Operate sorter	65.00	12.77	-52.23
H 1	Analyze job steps to determine data recovery points	61.67	10.64	-51.03
H 10	Maintain levels of data processing supplies	51.67	2.13	-49.54
H 20	Operate key punch machines or verifiers	75.00	25.53	-49.47
H 16	Operate decollator	53.33	4.26	-49.08
H 18	Operate forms bursting equipment	50.00	3.19	-46.81
H 8	Maintain card files (source object, etc.)	63.33	18.09	-45.25
H 50	Strip tape and add new load point	45.00	1.06	-43.94
H 19	Operate interpreter	56.67	12.77	-43.90
H 25	Operate reproducer	46.67	4.26	-42.41
H 14	Operate collator	45.00	3.19	-41.81
H 5	Interrogate memory locations on the console	45.00	4.26	-40.74
H 30	Perform debugging runs	53.33	17.02	-36.31
H 47	Splice magentic tape and leaders	36.67	1.06	-35.60
H 54	Wire control panels	38.33	3.19	-35.14
H 41	Schedule sequence of users during shift for effective organization of runs	35.00	1.06	-33.94
H 36	Prepare control decks	45.00	12.77	-32.23
H 55	Wire reproducer control panels	35.00	3.19	-31.81
H 11	Maintain technical files on equipment operation and procedural changes	33.33	2.13	-31.21

TABLE 9 continued

GROUP 1 = COMPUTER CONSOLE OPERATORS
GROUP 2 = PROGRAMMERS

D-TSK	TASK TITLE	PERCENT PERFORMING, GROUP 1	PERCENT PERFORMING, GROUP 2	DIFFERENCES IN PERCENT PERFORMING GROUP 2 MINUS GROUP 1
H 17	Operate document writer	28.33	2.13	-26.21
H 45	Select subroutines to accomplish jobs received for processing	28.33	2.13	-26.21
H 37	Prepare service action requests	28.33	2.13	-26.21
F 22	Operate office machines	28.33	5.32	-23.01
H 23	Operate punched card accounting machines	25.00	2.13	-22.87
H 49	Set up punched card accounting machines for operation	21.67	1.06	-20.60
	TASKS OMITTED WHERE DIFFERENCES IN PERCENT PERFORMING = -20.00 THROUGH 20.00			
D 7	Coordiante with operations on preparation of computer operating instructions	0.00	20.21	20.21
K 32	Edit computer programs for effective use of auxiliary storage media	1.67	25.53	23.87
K 33	Edit computer programs for efficient use of logical and arithmetical components	1.67	27.66	25.99
I 6	Write programs to print tapes, punch cards, or read cards	0.00	26.60	26.60
K 15	Design or lay out core storage formats	0.00	26.60	26.60
K 10	Code software utility programs	0.00	26.60	26.60
K 28	Develop flow charts for handling source data by off-line support equipment	0.00	27.66	27.66
K 50	Prepare control card sheets for utility or library programs	0.00	29.79	29.79
K 1	Adapt programs written in symbolic language to different computer configurations	0.00	31.91	31.91
K 42	Maintain library of documentation of general purpose and utility programs	1.67	34.04	32.38
K 58	Review existing routines for applicability of new techniques	1.67	34.04	32.38
K 54	Prepare instructions for operation of on-line peripheral equipment	3.33	37.23	33.90
K 13	Coordinate with system design personnel to prepare overall block diagrams	0.00	34.04	34.04
K 43	Manually convert numbers from one number system to another	1.67	38.30	36.63
K 48	Perform systems analysis to meet requirements of company functions	0.00	37.23	37.23
K 14	Design disk storage allocation	0.00	37.23	27.23
K 11	Code tape sort programs	1.67	40.43	38.76
K 29	Develop operation procedures for programming	1.67	40.43	38.76
K 30	Develop program logic charts for machine routines	1.67	41.49	39.82
K 27	Determine most applicable programming language for problems	0.00	40.43	40.43
K 6	Catalogue data sets	3.33	45.74	42.41
K 67	Write programs for the generation of data to be used for program testing	0.00	42.55	42.55
K 49	Prepare console operator's run books	8.33	53.19	44.86
K 34	Edit computer programs for effective use of memory	1.67	47.87	46.21
K 8	Code programs utilizing more than one language	1.67	50.00	48.33
K 2	Analyze applications to select appropriate utility programs and subroutines	0.00	48.94	48.94

TABLE 9 continued

GROUP 1 = COMPUTER CONSOLE OPERATORS
GROUP 2 = PROGRAMMERS

D-TSK	TASK TITLE	PERCENT PERFORMING, GROUP 1	PERCENT PERFORMING, GROUP 2	DIFFERENCES IN PERCENT PERFORMING GROUP 2 MINUS GROUP 1
K 16	Design or lay out disk storage formats	0.00	48.94	48.94
K 36	Incorporate utility routines into programs	1.67	51.06	49.40
K 60	Select appropriate utility programs	6.67	56.38	49.72
K 56	Prepare testing instructions and control test data for use of console operator during test audits	1.67	52.13	50.46
K 57	Recommend corrections or modifications to systems	0.00	52.13	52.13
K 12	Confer with functional area personnel to prepare specific program routines	0.00	52.13	52.13
K 41	Maintain and update library of program and processing documentation	3.33	57.45	54.11
K 5	Audit computer inputs after test run and follow-up	1.67	58.51	56.84
K 18	Design or lay out magnetic tape storage formats	3.33	60.64	57.30
K 31	Develop subroutines	0.00	57.45	57.45
K 62	Test revised computer programs	16.67	79.79	63.12
K 55	Prepare programming block diagrams	1.67	65.96	64.29
K 4	Analyze programming documentation	1.67	65.96	64.29
K 21	Design report formats	1.67	67.02	65.35
K 35	Incorporate standard routines into programs	1.67	67.02	65.35
K 3	Analyze computer inputs prior to test run and follow-up	1.67	68.09	66.42
K 61	Test new computer programs	20.00	88.30	68.30
K 51	Prepare detail flow charts	1.67	72.34	70.67
K 53	Prepare general and detailed flow charts	1.67	73.40	71.74
K 37	Insert standard changes into existing programs	1.67	76.60	74.93
K 65	Write programs for local one-time applications	1.67	77.66	75.99
K 45	Patch computer programs	1.67	77.66	75.99
K 26	Desk check programming logic for punching errors prior to assembly or compilation	1.67	78.72	77.06
K 52	Prepare documentation including formats and layouts for input and output media	1.67	82.98	81.31
K 59	Revise computer programs	1.67	84.04	82.38
K 9	Code routine computer programs	1.67	86.17	84.50
K 39	Isolate and correct programming errors discovered during test	1.67	91.49	89.82
K 25	Desk check or debug programs after assembly or compilation	1.67	94.68	93.01

TABLE 10 Description of the Differences in the Percent of Systems Personnel and the Percent of Programmers Performing the Same Tasks

GROUP 1 = SYSTEMS PERSONNEL
GROUP 2 = PROGRAMMERS

D-TSK	TASK TITLE	PERCENT PERFORMING, GROUP 1	PERCENT PERFORMING, GROUP 2	DIFFERENCE IN PERCENT PERFORMING GROUP 2 MINUS GROUP 1
N 1	Define objectives on system studies	43.33	5.32	-38.01
N 2	Develop directives pertaining to data systems	35.00	1.06	-33.94
N 12	Perform initial analysis of requests for systems studies	38.33	7.45	-30.89
M 18	Prepare documentation for systems flow charts	43.33	12.77	-30.57
M 14	Inspect system flow	40.00	9.57	-30.43
A 1	Analyze data processed for possible modification and combination of report	40.00	10.64	-29.36
M 27	Study purpose and design or new systems	36.67	7.45	-29.22
A 8	Inspect methods used to process data	35.00	6.38	-28.62
M 26	Review technological developments in processing, storage and information retrieval	31.67	3.19	-28.48
N 13	Prepare decision charts	30.00	2.13	-27.87
E 6	Establish standard data elements, codes, and names for systems design	31.67	4.26	-27.41
M 3	Coordinate with programmers and functional areas to establish new applications	35.00	8.51	-26.49
N 14	Prepare presentations on data systems operations	28.33	2.13	-26.21
N 11	Identify source documents, internal files and final reports	40.00	13.83	-26.17
N 8	Evaluate utilization of output products	30.00	4.26	-25.74
M 22	Prepare systems block diagrams	41.67	15.86	-25.71
N 5	Evaluate data for relationship of output to source documents	38.33	13.83	-24.50
N 4	Evaluate data for duplications and unnecessary requirements	38.33	13.83	-24.50
N 7	Evaluate problem areas adaptable to modifications	35.00	10.64	-24.36
E 2	Coordinate with programming supervisors in designing new programming systems	28.33	4.26	-24.08
N 10	Identify problem areas in the system	40.00	15.96	-24.04
E 3	Coordinate with staff in the development of new systems	30.00	6.38	-23.62
M 20	Prepare or analyze data for testing new systems	38.33	14.89	-23.44
L 7	Determine input-output characteristics and media for functional areas	25.00	2.13	-22.87
M 15	Monitor updating of format and data items	26.67	4.26	-22.41
M 2	Control system input and output	28.33	6.38	-21.95
A 9	Orient newly assigned data services personnel	28.33	6.38	-21.95
L 10	Evaluate present and proposed costs of input/output requirements	23.33	3.19	-20.14
M 13	Determine processing, storage, and retrieval techniques	35.00	14.89	-20.11

TASKS OMITTED WHERE DIFFERENCES IN PERCENT PERFORMING = -20.00 THROUGH 20.00

K 54	Prepare instrucions for operation of on-line peripheral equipment	16.67	37.23	20.57
K 31	Develop subroutines	36.67	57.45	20.78
K 34	Edit computer programs for effective use of memory	25.00	47.87	22.87
K 36	Incorporate utility routines into programs	26.67	51.06	24.40
K 49	Prepare console operator's run books	28.33	53.19	24.86
K 21	Design report formats	41.67	67.02	25.35
K 59	Revise computer programs	58.33	84.04	25.71
K 4	Analyze programming documentation	40.00	65.96	25.96

TABLE 10 continued

GROUP 1 = SYSTEMS PERSONNEL
GROUP 2 = PROGRAMMERS

D-TSK	TASK TITLE	PERCENT PERFORMING, GROUP 1	PERCENT PERFORMING, GROUP 2	DIFFERENCES IN PERCENT PERFORMING GROUP 2 MINUS GROUP 1
K 60	Select appropriate utility programs	30.00	56.38	26.38
K 5	Audit computer inputs after test run and follow-up	31.67	58.51	26.84
K 55	Prepare programming block diagrams	38.33	65.96	27.62
K 62	Test revised computer programs	51.67	79.79	28.12
K 53	Prepare general and detailed flow charts	45.00	73.40	28.40
K 61	Test new computer programs	58.33	88.30	29.96
K 18	Design or lay out magnetic tape storage formats	30.00	60.64	30.64
K 51	Prepare detail flow charts	41.67	72.34	30.67
K 45	Patch computer programs	46.67	77.66	30.99
K 52	Prepare documentation including formats and layouts for input and output media	51.67	82.98	31.31
K 26	Desk check programming logic for punching errors prior to assembly or compilation	45.00	78.72	33.72
K 56	Prepare testing instructions and control test data for use of console operator during test audits	18.33	52.13	33.79
K 9	Code routine computer programs	50.00	86.17	36.17
K 3	Analyze computer inputs prior to test run and follow-up	31.67	68.09	36.42
K 25	Desk check or debug programs after assembly or compilation	56.67	94.68	38.01
K 39	Isolate and correct programming errors discovered during testing	53.33	91.49	38.16
K 35	Incorporate standard routines into programs	28.33	67.02	38.69
K 65	Write programs for local one-time applications	38.33	77.66	39.33
K 37	Insert standard changes into existing programs	36.67	76.60	39.33

TABLE 11 Description of the Differences in the Percent of Managers and the Percent of Programmers Performing the Same Tasks

GROUP 1 - MANAGERS
GROUP 2 = PROGRAMMERS

D-TSK	TASK TITLE	PERCENT PERFORMING, GROUP 1	PERCENT PERFORMING, GROUP 2	DIFFERENCE IN PERCENT PERFORMING GROUP 2 MINUS GROUP 1
C 11	Evaluate work performance of operators	61.40	0.00	-61.40
C 4	Coordinate scheduling of machine work load	63.16	2.13	-61.03
C 12	Inform person of prime responsibility of repeated errors in input data	66.67	6.38	-60.28
C 23	Prepare recommendations for improved efficiency in automatic data processing equipment operations	61.40	3.19	-58.21
A 11	Monitor the meeting of deadlines	61.40	3.19	-58.21
C 20	Plan and schedule work assignments for operators	57.89	0.00	-57.89
C 15	Monitor the maintenance of utilization logs on automatic data processing equipment	57.89	0.00	-57.89
C 3	Coordinate one time report requirements with person of prime responsibility	63.16	5.32	-57.84
C 5	Coordinate with programmers and systems personnel on matters of joint interest	57.89	1.06	-56.83
C 34	Supervise data processing machine operators	54.39	0.00	-54.39
A 8	Inspect methods used to process data	59.65	6.38	-53.27
C 2	Coordinate errors in programming logic with programmers	56.14	3.19	-52.95
A 7	Evaluate work performance of data services personnel	54.39	2.13	-52.26
A 15	Plan and schedule data services work assignments	52.63	1.06	-51.57
C 19	Plan and schedule duty assignments for data automation activity	50.88	0.00	-50.88
C 7	Develop computer operating instructions	57.89	8.51	-49.38
A 12	Notify person of prime responsibility of deadlines	54.39	5.32	-49.07
C 18	Plan and conduct on-the-job training in data processing procesures	47.37	0.00	-47.37
C 33	Supervise apprentice data processing machine operators	47.37	0.00	-47.37
C 32	Schedule machine inspection and repair	47.37	0.00	-47.37
C 13	Maintain operating manuals and directives affecting machine room function	49.12	2.13	-47.00
C 8	Establish data automation production controls and standards	47.37	1.06	-46.30
C 1	Control tape utilization and assignment	47.37	1.06	-46.30
A 13	Order data automation supplies and equipment	47.37	1.06	-46.30
C 30	Schedule basic input into automated data systems	49.12	3.19	-45.93
C 17	Plan and conduct on-the-job training in data processing equipment operation	45.61	1.06	-44.55
A 23	Supervise operation of punched card or tape filing systems	43.86	0.00	-43.86
A 22	Supervise distribution of reports or programs	47.37	4.26	-43.11
C 22	Prepare operating instructions concerning local reports	49.12	6.38	-42.74
C 16	Perform periodic inspections of data automation activities	42.11	0.00	-42.11
C 24	Perpare recommendations for local operating instructions concerning programs	43.86	2.13	-41.73
C 27	Requisition supplies	40.35	0.00	-40.35
A 16	Plan facility modification	40.35	0.00	-40.35
A 1	Analyze data processed for possible modification and combination of report	50.88	10.64	-40.24
C 10	Evaluate performance history on specific jobs	42.11	2.13	-39.98
A 5	Coordinate work of data serivces unit with activities furnishing report data	45.61	6.38	-39.23

TABLE 11 continued

GROUP 1 = MANAGERS
GROUP 2 = PROGRAMMERS

D-TSK	TASK TITLE	PERCENT PERFORMING, GROUP 1	PERCENT PERFORMING, GROUP 2	DIFFERENCE IN PERCENT PERFORMING GROUP 2 MINUS GROUP 1
C 9	Evaluate office of prime responsibility equipment utilization and maintenance	38.60	0.00	-38.60
C 35	Supervise data processing machine supervisors	38.60	0.00	-38.60
A 6	Establish data services production controls and standards	45.61	7.45	-38.17
C 6	Design system of magentic tape management	38.60	1.06	-37.53
A 9	Orient newly assigned data services personnel	43.86	6.38	-37.48
A 18	Review machine run reports for accuracy	45.61	8.51	-37.10
A 19	Schedule input from person of prime responsibility	38.60	3.19	-35.40
A 4	Conduct on-the-job training for data services personnel	38.60	3.19	-35.40
A 14	Perform automatic data processing equipment financial planning	35.09	0.00	-35.09
C 31	Schedule basic input into manual data systems	36.86	2.13	-34.71
C 26	Requisition auxiliary data processing equipment such as decollators or forms bursters	31.58	0.00	-31.58
C 21	Prepare cost reports and cost estimates for data automation equipment	31.58	0.00	-31.58
C 25	Prepare shift reports	29.82	0.00	-29.82
A 17	Prepare or audit personnel records	31.58	2.13	-29.45
F 29	Prepare recommendations for improved efficiency in operations	33.33	4.26	-29.08
A 2	Analyze data processed to make sure that desired information is obtained	47.37	19.15	-28.22
A 21	Supervise data services specialists	28.07	0.00	-28.07
C 14	Maintain training records on operators	28.07	0.00	-28.07
A 10	Maintain training records for data services personnel	29.82	2.13	-27.70
B 1	Brief supervisor and staff	29.82	3.19	-26.63
F 32	Schedule computer runs for several days or more in advance	31.58	5.32	-26.26
D 16	Establish run priorities for operations	31.58	5.32	-26.26
H 10	Maintain levels of data processing supplies	28.07	2.13	-25.94
C 28	Review completed programs for accuracy	33.33	7.45	-25.89
F 12	Coordinate production control schedules	29.82	4.26	-25.57
H 41	Schedule sequence of users during shift for effective organization of runs	26.32	1.06	-25.25
F 13	Coordinate with operators, programmers, or systems personnel on matters of joint interest	43.86	19.15	-24.71
C 29	Review or prepare cost estimates of equipment utilization	24.56	0.00	-24.56
F 31	Read and interpret regulations, manuals, or administrative orders	36.84	12.77	-24.08
H 50	Strip tape and add new load point	24.56	1.06	-23.50
H 4	Determine cause of machine stops and malfunctions	36.84	13.83	-23.01
A 20	Serve on inspection teams to evaluate other data systems units	22.81	0.00	-22.81
H 11	Maintain technical files on equipment operation and procedural changes	24.56	2.13	-22.43
H 40	Review processing steps before job is put on computer	31.58	9.57	-22.00
E 3	Coordinate with staff in the development of new systems	28.07	6.38	-21.69
H 12	Make switch settings	24.56	3.19	-21.37
B 5	Establish management analysis job priorities	21.05	0.00	-21.05
H 9	Maintain current run tapes	26.32	5.32	-21.00

TABLE 11 continued

GROUP 1 = MANAGERS
GROUP 2 = PROGRAMMERS

D-TSK	TASK TITLE	PERCENT PERFORMING, GROUP 1	PERCENT PERFORMING, GROUP 2	DIFFERENCE IN PERCENT PERFORMING GROUP 2 MINUS GROUP 1
F 10	Control basic input into automated data systems	24.56	4.26	-20.31
	TASKS OMITTED WHERE DIFFERENCES IN PERCENT PERFORMING = -20.00 THROUGH 20.00			
K 58	Review existing routines for applicability of new techniques	14.04	34.04	20.01
K 33	Edit computer programs for efficient use of logical and arithmetical components	7.02	27.66	20.64
K 50	Prepare control card sheets for utility or library programs	8.77	29.79	21.02
K 28	Develop flow charts for handling source data by off-line support equipment	5.26	27.66	22.40
K 13	Coordinate with system design personnel to prepare overall block diagrams	10.53	34.04	23.52
K 48	Perform systems analysis to meet requirements of company functions	12.28	37.23	24.95
K 54	Prepare instructions for operation of on-line peripheral equipment	10.53	37.23	26.71
K 11	Code tape sort programs	12.28	40.43	28.14
K 27	Determine most applicable programming language for problems	12.28	40.43	28.14
K 14	Design disk storage allocation	8.77	37.23	28.46
K 42	Maintain library of documentation of general purpose and utility programs	5.26	34.04	28.78
K 57	Recommend corrections or modifications to systems	22.81	52.13	29.32
K 43	Manually convert numbers from one number system to another	8.77	38.30	29.53
K 29	Develop operation procedures for programming	10.53	40.43	29.90
K 30	Develop program logic charts for machine routines	10.53	41.49	30.96
K 67	Write programs for the generation of data to be used for program testing	8.77	42.55	33.78
K 6	Catalogue data sets	8.77	45.74	36.97
K 34	Edit computer programs for effective use of memory	10.53	47.87	37.35
K 2	Analyze applications to select appropriate utility programs and subroutines	10.53	48.94	38.41
K 36	Incorporate utility routines into programs	12.28	51.06	38.78
K 49	Prepare console operator's run books	14.04	53.19	39.16
K 8	Code programs utilizing more than one language	10.53	50.00	39.47
K 56	Prepare testing instructions and control test data for use of console operator during test audits	10.53	52.13	41.60
K 16	Design or lay out disc storage formats	7.02	48.94	41.92
K 60	Select appropriate utility programs	14.04	56.38	42.35
K 5	Audit computer inputs after test run and follow-up	15.79	58.51	42.72
K 12	Evaluate use of existing sytems or programs for pilot projects	8.77	52.13	43.36
K 31	Develop subroutines	14.04	57.45	43.41
K 41	Maintain and up date library of program and processing documentation	14.04	57.45	43.41
K 18	Design or lay out magnetic tape storage formats	14.04	60.64	46.60
K 4	Analyze programming documentation	19.30	65.96	46.66
K 21	Design report formats	14.04	67.02	52.99
K 55	Prepare programming block diagrams	12.28	65.96	53.68

TABLE 11 continued

GROUP 1 = MANAGERS
GROUP 2 = PROGRAMMERS

D-TSK	TASK TITLE	PERCENT PERFORMING, GROUP 1	PERCENT PERFORMING, GROUP 2	DIFFERENCE IN PERCENT PERFORMING GROUP 2 MINUS GROUP 1
K 3	Analyze computer inputs prior to test run and follow-up	12.28	68.09	55.80
K 35	Incorporate standard routines into programs	10.53	67.02	56.49
K 51	Prepare detail flow charts	15.79	72.34	56.55
K 37	Insert standard changes into existing programs	17.54	76.60	59.05
K 53	Prepare general and detailed flow charts	14.04	73.40	59.37
K 45	Patch computer programs	17.54	77.66	60.12
K 62	Test revised computer programs	19.30	79.79	60.49
K 65	Write programs for local one-time applications	15.79	77.66	61.87
K 26	Desk check programming logic for punching errors prior to assembly or compilation	15.79	78.72	62.93
K 59	Revise computer programs	17.54	84.04	66.50
K 9	Code routine computer programs	19.30	86.17	66.87
K 52	Prepare documentation including formats and layouts for input and output media	15.79	82.98	67.19
K 61	Test new computer programs	19.30	88.30	69.00
K 39	Isolate and correct programming errors discovered during testing	17.54	91.49	73.95
K 25	Desk check or debug programs after assembly or compilation	14.04	94.68	80.65

TABLE 12 Description of the Differences in the Percent of Managers and the Percent of Systems Personnel Performing the Same Tasks

GROUP 1 = MANAGERS
GROUP 2 = SYSTEMS PERSONNEL

D-TSK	TASK TITLE	PERCENT PERFORMING, GROUP 1	PERCENT PERFORMING, GROUP 2	DIFFERENCE IN PERCENT PERFORMING GROUP 2 MINUS GROUP 1
C 11	Evaluate work performance of operators	61.40	3.33	-58.07
C 4	Coordinate scheduling of machine work load	63.16	8.33	-54.82
C 12	Inform person of prime responsibility of repeated errors in input data	66.67	13.33	-53.33
C 20	Plan and schedule work assignments for operators	57.89	5.00	-52.89
C 15	Monitor the maintenance of utilization logs on automatic data processing equipment	57.89	5.00	-52.89
C 34	Supervise data processing machine operators	54.39	5.00	-49.39
C 19	Plan and schedule duty assignments for data automation	50.88	1.67	-49.21
C 23	Prepare recommendations for improved efficiency in automatic data processing equipment operations	61.40	13.33	-48.07
A 11	Monitor the meeting of deadlines	61.40	13.33	-48.07
C 30	Schedule basic input into automated data systems	49.12	1.67	-47.46
C 33	Supervise apprentice data processing machine operators	47.37	0.00	-47.37
C 1	Control tape utilization and assignment	47.37	1.67	-45.70
A 15	Plan and schedule data services work assignments	52.63	8.33	-44.30
A 13	Order data automation supplies and equipment	47.37	3.33	-44.04
C 32	Schedule machine inspection and repair	47.37	3.33	-44.04
C 3	Coordinate one time report requirements with person of prime responsibility	63.16	20.00	-43.16
A 12	Notify person of prime responsibility of deadlines	54.39	11.67	-42.72
A 7	Evaluate work performance of data serivces personnel	54.39	11.67	-42.72
C 22	Prepare operating instructions concerning local reports	49.12	6.67	-42.46
C 18	Plan and conduct on-the-job training in data processing procedures	47.37	5.00	-42.37
A 23	Supervise operation of punched card or tape filing systems	43.86	3.33	-40.53
C 2	Coordinate errors in programming logic with programmers	56.14	16.67	-39.47
A 22	Supervise distribution of reports or programs	47.37	8.33	-39.04
C 17	Plan and conduct on-the-job training in data processing equipment operation	45.61	6.67	-38.95
C 16	Perform periodic inspections of data automation activities	42.11	3.33	-38.77
C 5	Coordinate with programmers and systems personnel on matters of joint interest	57.89	20.00	-37.89
C 13	Maintain operating manuals and directives affecting machine room function	49.12	11.67	-37.46
C 27	Requisition supplies	40.35	3.33	-37.02
C 7	Develop computer operating instructions	57.89	21.67	-36.23
C 9	Evaluate office of prime responsibility equipment utilization and maintenance	38.60	3.33	-35.26
C 35	Supervise data processing machine supervisors	38.60	3.33	-35.26
C 31	Schedule basic input into manual data systems	36.84	1.67	-35.18
C 24	Prepare recommendations for local operating instructions concerning programs	43.86	10.00	-33.86
C 10	Evaluate performance history on specific jobs	42.11	8.33	-33.77
A 19	Schedule input from person of prime responsibility	38.60	5.00	-33.60
A 6	Establish data services production controls and standards	45.61	13.33	-32.28
C 8	Establish data automation production controls and standards	47.37	16.67	-30.70
A 16	Plan facility modification	40.35	10.00	-30.35

TABLE 12 continued

GROUP 1 = MANAGERS
GROUP 2 - SYSTEMS PERSONNEL

D-TSK	TASK TITLE	PERCENT PERFORMING, GROUP 1	PERCENT PERFORMING, GROUP 2	DIFFERENCES IN PERCENT PERFORMING GROUP 2 MINUS GROUP 1
C 6	Design system of magnetic tape management	38.60	8.33	-30.26
A 14	Perform automatic data processing equipment financial planning	35.09	5.00	-30.09
A 18	Review machine run reports for accuracy	45.61	16.67	-28.95
A 17	Prepare or audit personnel records	31.58	3.33	-28.25
C 26	Requisition auxiliary data processing equipment such as decollators or forms bursters	31.58	3.33	-28.25
C 21	Prepare cost reports and cost estimates for data automation equipment	31.58	3.33	-28.25
H 10	Maintain levels of data processing supplies	28.07	0.00	-28.07
A 10	Maintain training records for data services personnel	29.82	3.33	-26.49
C 14	Maintain training records on operators	28.07	1.67	-26.40
C 25	Prepare shift reports	29.82	5.00	-24.82
A 8	Inspect methods used to process data	59.65	35.00	-24.65
H 41	Schedule sequence of users during shift for effective organization of runs	26.32	1.67	-24.65
A 5	Coordinate work of data services unit with activities furnishing report data	45.61	21.67	-23.95
A 4	Conduct on-the-job training for data services personnel	38.60	15.00	-23.60
F 32	Schedule computer runs for several days or more in advance	31.58	8.33	-23.25
H 38	Prepare special carriage control tapes	29.82	6.67	-23.16
F 12	Coordinate production control schedules	29.82	6.67	-23.16
D 16	Establish run priorities for operations	31.58	10.00	-21.58
B 1	Brief supervisor and staff	29.82	8.33	-21.49
H 9	Maintain current run tapes	26.32	5.00	-21.32
H 50	Strip tape and add new load point	24.56	3.33	-21.23
H 31	Perform operator maintenance on automatic data processing equipment	21.05	0.00	-21.05
F 7	Compute due-in and due-out dates for controlled reports	21.05	0.00	-21.05

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TASKS OMITTED WHERE DIFFERENCES IN PERCENT PERFORMING = -20.00 THROUGH 20.00

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K 4	Analyze programming documentation	19.30	40.00	20.70
N 7	Evaluate problem areas adaptable to modifications	14.04	35.00	20.96
N 14	Prepare presentations on data systems operations	7.02	28.33	21.32
L 18	Prepare detailed document flow diagrams	5.26	26.67	21.40
K 65	Write programs for local one-time applications	15.79	38.33	22.54
M 10	Design punched card media layouts	14.04	36.67	22.63
M 27	Study purpose and design or new systems	14.04	36.67	22.63
K 31	Develop subroutines	14.04	36.67	22.63
E 6	Establish standard data elements, codes, and names for systems design	8.77	31.67	22.89
K 14	Design disk storage allocation	8.77	31.67	22.89
N 13	Prepare decision charts	7.02	30.00	22.98
M 2	Control system input and output	5.26	28.33	23.07
L 17	Prepare computer logic diagrams	1.75	25.00	23.25
N 1	Define objectives of system studies	19.30	43.33	24.04
M 14	Inspect system flow	15.79	40.00	24.21

TABLE 12 continued

GROUP 1 = MANAGERS
GROUP 2 = SYSTEMS PERSONNEL

D-TSK	TASK TITLE	PERCENT PERFORMING, GROUP 1	PERCENT PERFORMING, GROUP 2	DIFFERENCES IN PERCENT PERFORMING GROUP 2 MINUS GROUP 1
K 2	Analyze applications to select appropriate utility programs and subroutines	10.53	35.00	24.47
K 12	Confer with functional area personnel to prepare specific program routines	8.77	33.33	24.56
K 16	Design or lay out disk storage formats	7.02	31.67	24.65
K 51	Prepare detail flow charts	15.79	41.67	25.88
K 41	Maintain and update library of program and processing documentation	14.04	40.00	25.96
K 55	Prepare programming block diagrams	12.28	38.33	26.05
N 4	Evaluate data for duplications and unnecessary requirements	12.28	38.33	26.05
K 8	Code programs utilizing more than one language	10.53	36.67	26.14
N 6	Evaluate file contents and sequences	10.53	36.67	26.14
N 2	Develop directives pertaining to data systems	8.77	35.00	26.23
K 21	Design report formats	14.04	41.67	27.63
N 12	Perform initial analysis of requests for systems studies	10.53	38.33	27.81
K 45	Patch computer programs	17.54	46.67	29.12
K 26	Desk check programming logic for punching errors prior to assembly or compilation	15.79	45.00	29.21
M 22	Prepare systems block diagrams	12.28	41.67	29.39
N 5	Evaluate data for relationship of output to source documents	8.77	38.33	29.56
K 9	Code routine computer programs	19.30	50.00	30.70
K 53	Prepare general and detailed flow charts	14.04	45.00	30.96
M 18	Prepare documentation for systems flow charts	12.28	43.33	31.05
K 48	Perform systems analysis to meet requirements of company functions	12.28	43.33	31.05
M 20	Prepare or analyze data for testing new systems	7.02	38.33	31.32
K 62	Test revised computer programs	19.30	51.67	32.37
N 11	Identify source documents, internal files and final reports	7.02	40.00	32.98
K 39	Isolate and correct programming errors discovered during testing	17.54	53.33	35.79
K 52	Prepare documentation including formats and layouts for input and output media	15.79	51.67	35.88
K 61	Test new computer programs	19.30	58.33	39.04
K 59	Revise computer programs	17.54	58.33	40.79
K 25	Desk check or debug programs after assembly or compilation	14.04	56.67	42.63

Revision of the Task Inventory Based on the Validation

The original task inventory was constructed as an open-ended instrument in that the workers were asked to write-in and rate any tasks they performed which were not listed. As a result, several respondents did write in task statements describing tasks they perform and that were not included in the original inventory. Following is a listing of the tasks which were added to the inventory by the respondents:

- Analyze company operations to determine where most significant improvements can be made
- Analyze documentation for completeness and accuracy for data processing operations and control
- Balance and correct reports
- Develop standards and factors for use in management control systems
- Fill out question and inventory forms
- Monitor maintenance of utilization logs
- Monitor production controls and standards
- Review operations to devise more efficient procedures
- Inventory electronic data processing supplies
- Plan personnel management
- Review personnel for raise recommendations
- Train personnel in method of creating input and using output
- Analyze programs, evaluations, reviews or reports for problem identification
- Identify problem areas in existing systems
- Perform program analysis
- Prepare correspondence concerning data services
- Prepare operational briefings
- Process request for new or revised reports
- Read and interpret regulations manuals or administrative orders
- Review completed programs for accuracy
- Review requests for development of existing systems
- Review unit and individual training data
- Develop and maintain procedures relative to computer input and product distribution including quality check
- Change sequence of jobs run to cut down operational steps
- Initiate all computer operating notes, technical bulletins etc., for job performance improvements
- Log and scratch expired tapes in library
- Perform disk-to-plotter operation
- Perform disk-to-printer operation
- Perform on-the-job training of operators
- Perform punched card-to-disk conversion operation
- Perform tape-to-tape operation (copy)
- Prepare labels for output tapes
- Prepare control cards for jobs
- Record time log for scheduled jobs
- Analyze and debug manufactured software
- Develop maintenance procedures for the operating system
- Diagnose and correct operating system component errors
- Maintain back-up procedures for the operating system
- Maintain manufacturer supplies on-line teleprocessing system
- Perform system generation, establish source and relocatable library sizes, etc.
- Plan, coordinate, and install new hardware and software
- Select various components to be used in creating new operating system
- Work with operations supervisor to determine best operating procedures to be followed
- Write macros, catalog macros, standard source and relocatable data
- Minimize program size
- Optomize program execution times
- Write programs for matrix inversion
- Write programs to produce design plans via use of plotter
- Write programs to provide design data
- Analyze core dumps, evaluate and recommend solutions
- Analyze programs, evaluations, reviews or reports for problem identification
- Code disk sort programs
- Coordinate with functional areas on programming aspects of new systems being devised and reports being developed
- Debug programs
- Develop computer operating instructions, technical bulletins
- Develop systems for collecting, processing, and storing data
- Exploit parallel processing capabilities to gain operational effectiveness
- Extract figures needed for special analysis and studies
- Perform program analysis
- Read and interpret regulations, manuals, or administrative orders

These written-in task statements along with the data describing the number of workers performing each task were used to revise the original task inventory that was administered to the sample of business data processing workers. All the written-in task statements were added to the task inventory since it was assumed that if the task was important enough to be written in by an incumbent worker, it should be included in the inventory for validation by a large group of workers.

All the task statements that were not checked by at least five percent of the sample were examined and omitted from the revised inventory if the task was not judged to be critical for successful employment in the occupational area. Elimination of all task statements not checked by at least five revealed that the task statements composing two entire duties were removed from the original task inventory. These duties were: (1) supervising management analysis, and (2) perform management analysis functions. This would tend to indicate that management analysis duties and tasks are not performed by workers in business data processing occupations and therefore, should not be included in the task inventory.

The revised task inventory for the business data processing occupational area is presented in Appendix D. It is recommended that future occupational performance surveys should utilize the revised task inventory.

CHAPTER IV
SUMMARY AND CONCLUSIONS

It is the purpose of this report to present the findings of the task inventory analysis of occupational performance which was conducted to ascertain what tasks are actually being performed by workers employed in the occupational area of data processing. The findings of this analysis will be valuable to instructors teaching data processing technology, vocational and technical institutions offering programs in data processing technology and also to local, state, and other personnel concerned with the development and evaluation of programs in data processing technology.

A task inventory was constructed utilizing existing data processing occupations task lists, job descriptions, and curriculum guides. The initial inventory was reviewed and revised using five consultants who were employed in data processing occupations. A total of 406 task inventories were completed and returned by workers employed in the data processing occupational area. This number represented an 81 percent return from the 500 sampled. The task data along with the background data were coded and tabulated by the project staff at The Center for Vocational and Technical Education. The background variable relative to the type of businesses in which the workers were employed revealed that 35.5 percent were employed in government, 23.2 percent employed in manufacturing, 17 percent in insurance, 12.1 percent in distribution (wholesale-retail), 3.9 in research and education, and 8.3 percent were employed in other types of businesses, thus achieving the type of representation initially desired.

The workers, relative to their positions, were distributed almost equally across job titles. Managerial job titles presented 15.3 percent of the respondents, 17.5 percent were employed as systems personnel, 26.3 percent were programmers, 15 percent were computer console operators and 13.1 percent were employed as data converting operators. Job titles not listed in one of the five categories were checked by the respondents as "other" on the original inventory. This group consisted of 12.8 percent of the workers.

It was found that the most frequent sources of training checked by the respondents were on-the-job (self-learned), equipment manufacturers, and company-in-plant training programs. These three sources accounted for a total of 75 percent of the workers responses to the question of where they received their training in data processing. Twenty-one percent of the workers checked educational institutions as the source of training, and 4 percent of the respondents received training in the military and through correspondence courses.

The survey is believed to be a representative sample of workers in the data processing occupational area. The sample size, distribution of job titles and types of businesses are supportive in extrapolating to the general population. The following conclusions appear to be warranted by the data:

1. The task list constructed by the project staff is representative of those tasks which are performed by workers in data processing occupational area.
2. The percent of workers performing each task in the data processing occupation was determined.
3. The relative time spent in performing each of the tasks was validated for workers in data processing.
4. A task job description for the job titles within the data processing occupational area was validated.
5. The data indicate that there are tasks which are common to all job titles within the data processing occupational area.
6. The data clearly indicate that an occupational career ladder is very evident from the lowest to the highest job titles through an analysis of tasks common to those positions of employment in the data processing occupational area.

It was noted earlier that the data reported herein were collected and analyzed as a preliminary stage in a longer-ranged research effort to develop a set of procedures for the identification and selection of curriculum content. That research and development effort is continuing.

In the meantime, the brief overview of the methods and techniques used for task inventory analysis, provided in this report, along with the identification of selected sources for more detailed descriptions of the methods, should be of interest and use to other vocational researchers: particularly those engaged in research and development related to curriculum development and to occupational competency testing. Moreover, the data themselves provide one additional source to relatively specific occupational information which should be useful to vocational instructors and curriculum developers of business data processing training programs.

APPENDIX A
Criteria For Appropriate Task Inventory Statements

APPENDIX A
CRITERIA FOR APPROPRIATE TASK INVENTORY STATEMENTS

1. Clear statement that is easily understood by the worker.
2. Statement written using terminology that is consistent with current usage in the occupational area.
3. Brief statement to save reading time.
4. Use abbreviations cautiously since they may not be understood throughout the occupational area.
5. Task statement must be ratable in terms of *time spent* and other rating factors (eliminate tasks beginning with "Have responsibility for ...," "Know how to ...").
6. Vague or ambiguous words such as "check," "assist," and "recommend" should be avoided.
7. Use short words in place of long ones whenever possible.
8. Qualifications of a worker such as aptitude, education, or skill are not tasks and are, therefore, not included in task statements.
9. Instruction a person receives is not a task unless the worker performs a task.
10. Task statements should begin with a present tense action word such as "operate," "write," and "clean."
11. Arrange task statements alphabetically under each duty statement to facilitate ease of scanning and to eliminate duplicate tasks.
12. Each task statement must be capable of standing alone, i.e., NOT "operate other equipment."
13. Each task statement must be a complete sentence.
14. Omit the period at the end of the task statement.
15. Avoid "and/or" and "etc."
16. Parallel tasks should be included in appropriate duty categories, i.e., for a "supervise" task there should be a task that is "performed."
17. If a modifier is used to be sure to include all relevant alternatives i.e., "repair *automatic* transmissions." Should also have "repair *standard* transmissions."
18. Avoid obviously trivial tasks, e.g., turn ignition key.
19. Avoid tasks that are too general.
20. Avoid multiple verbs unless the sequence is essential to the task.
21. Tasks should be independent and distinct.

APPENDIX B
Task Inventory Specimens

THE CENTER FOR VOCATIONAL AND TECHNICAL EDUCATION

Phone (614) 486-3655

THE OHIO STATE UNIVERSITY
1960 KENNY ROAD
COLUMBUS, OHIO 43210

Dear Data Processor:

We need your help! We are conducting a study that we believe you will find interesting and helpful to your profession. We are attempting to assemble and validate a complete list of jobs and tasks performed by data processors.

We will use this information to revise existing data processing curricula in order to improve the quality of training programs being offered for persons in data processing.

What we are asking for is a little of your time, and the results of your experience on the job, to review the enclosed task inventory for data processing. Only you can tell us whether these lists are complete and accurate.

Please fill out the brief informational page and follow the directions for checking and rating the tasks on the list. We have enclosed an Ohio State pen and a stamped envelope for completing and returning the inventory. The pen is yours to keep as a token of our appreciation for your help.

We are depending on you to provide us with the necessary information for improving data processing programs. Please complete and return the inventory TODAY!

Sincerely,

Sid Borcher
Research Specialist

BACKGROUND INFORMATION

Check Your Present Job Title:

- ☐ Manager, Data Processing
- ☐ Manager, Computer Operations
- ☐ Manager, EDP
- ☐ Systems Engineer
- ☐ Systems Programmers
- ☐ Systems and Procedures Analysts
- ☐ Senior Programmer
- ☐ Lead Programmer
- ☐ Programmer
- ☐ Programmer, Junior
- ☐ Computer Console Operator
- ☐ Data Converting Operator

Other (Specify) _____

Check The Type Of Business You Are Employed In:

- ☐ Manufacturing
- ☐ Insurance
- ☐ Distribution (Wholesale-Retail)
- ☐ Banking - Finance
- ☐ Data Processing Service Bureaus
- ☐ Public Utilities
- ☐ Research + Education
- ☐ Government
- ☐ Publishing
- ☐ Construction

Other (Specify) _____

How Many Years Have You Worked At Your Present Job? _____
How Many Years Have You Worked In Data Processing? _____

Where Did You Receive Your Training In Data Processing?
(Check one or more)

- ☐ On-The-Job (Self-Learned)
- ☐ Military Training School
- ☐ Company In-Plant Training Programs
- ☐ Equipment Manufacturers' Training Programs
- ☐ Correspondence Courses
- ☐ Public Secondary Schools
- ☐ Public Vocational-Technical Schools
- ☐ Junior College
- ☐ College or University
- ☐ Private Business School

Other (Specify) _____

INSTRUCTIONS FOR COMPLETING TASK INVENTORY

Carefully read each of the *Task Statements* and place a check mark (√) in the column labeled *check* for each task which you perform on your present job.

After checking all tasks which you perform, then rate only the task you have checked by placing a number 1, 2, 3, 4, 5, 6, or 7 in the column labled *Time Spent* which most closely estimates the amount of time you spend in performing the task.

Time Spent means the total time you spend on each task you are rating, compared with the time you spend on each of the other tasks you do.

At the bottom on any page, write in and rate any tasks you do which are not listed.

EXAMPLE:

DATA PROCESSING TASK INVENTORY	Page _____ of _____ Pages	
LISTED BELOW ARE A DUTY AND THE TASKS WHICH IT INCLUDES. CHECK ALL TASKS WHICH YOU PERFORM. ADD ANY TASKS YOU DO WHICH ARE NOT LISTED, THEN RATE THE TASKS YOU HAVE CHECKED.	CHECK √ If Done	TIME SPENT 1. Very Much Below Average 2. Below Average 3. Slightly Below Average 4. About Average 5. Slightly Above Average 6. Above Average 7. Very Much Above Average
K. PROGRAMMING COMPUTERS		
1. Adapt programs written in symbolic language to different computer configurations	✓	4
2. Analyze applications to select appropriate utility programs and subroutines	✓	2
3. Analyze computer inputs prior to test run and follow-up	✓	1
4. Analyze programming documentation		
5. Audit computer inputs after test run and follow-up	✓	6
6. Code computer applications using a reports program generator		
7. Code programs utilizing more than one language	✓	7

DATA PROCESSING TASK INVENTORY

LISTED BELOW ARE A DUTY AND THE TASKS WHICH IT INCLUDES. CHECK ALL TASKS WHICH YOU PERFORM. ADD ANY TASKS YOU DO WHICH ARE NOT LISTED, THEN RATE THE TASKS YOU HAVE CHECKED.

H. OPERATING AUTOMATIC DATA PROCESSING EQUIPMENT	CHECK: ✓ If Done	TIME SPENT (1. Very Much Below Average; 2. Below Average; 3. Slightly Below Average; 4. About Average; 5. Slightly Above Average; 6. Above Average; 7. Very Much Above Average)
1. Analyze job steps to determine data recovery points		
2. Analyze machine operation through use of messages received from the equipment		
3. Analyze machine operation through use of conditions displayed		
4. Determine cause of machine stops and malfunctions		
5. Interrogate memory locations on the console		
6. Load programs and data cards		
7. Locate tapes in storage media or tape library		
8. Maintain card files (source object, etc.)		
9. Maintain current run tapes		
10. Maintain levels of data processing supplies		
11. Maintain technical files on equipment operation and procedural changes		
12. Make switch settings		
13. Operate card reader		
14. Operate collator		
15. Operate console		
16. Operate decollator		
17. Operate document writer		
18. Operate forms bursting equipment		
19. Operate interpreter		
20. Operate key punch machines or verifiers		
21. Operate magnetic tape unit		
22. Operate paper tape punch and reader		

APPENDIX C
Original Business Data Processing Task Inventory

APPENDIX C
ORIGINAL BUSINESS DATA PROCESSING TASK INVENTORY

A. SUPERVISING DATA SERVICES FUNCTIONS

1. Analyze data processed for possible modification and combination of reports.
2. Analyze data processed to make sure that desired information is obtained.
3. Analyze functional area reports for format errors.
4. Conduct on-the-job training for data services personnel.
5. Coordinate work of data services unit with activities furnishing report data.
6. Establish data services production controls and standards.
7. Evaluate work performance of data services personnel.
8. Inspect methods used to process data.
9. Orient newly assigned data services personnel.
10. Maintain training records for data services personnel.
11. Monitor the meeting of deadlines.
12. Notify person of prime responsibility of deadlines.
13. Order data automation supplies and equipment.
14. Perform automatic data processing equipment financial planning.
15. Plan and schedule data services work assignments.
16. Plan facility modification.
17. Prepare or audit personnel records.
18. Review machine run reports for accuracy.
19. Schedule input from person of prime responsibility.
20. Serve on inspection teams to evaluate other data systems units.
21. Supervise data services specialists.
22. Supervise distribution of reports or programs.
23. Supervise operation of punched card or tape filing systems.
24. Supervise the maintenance of publications and reports management authority files.

B. SUPERVISING MANAGEMENT ANALYSIS

1. Brief supervisor and staff.
2. Conduct on-the-job training for management analysis personnel.
3. Coordinate work of management analysis with staff sections and other activities.
4. Develop standards and factors for use in management control systems.
5. Establish management analysis job priorities.
6. Evaluate work performance of management analysis personnel.
7. Inspect subordinates' method of analyzing management data.
8. Maintain library of manuals, directives, or publications on management analysis.
9. Maintain train records on management analysis personnel.
10. Orient newly assigned management analysis personnel.
11. Perform management analysis inspections.
12. Plan management analysis personnel requirements.
13. Plan management analysis workloads and make work assignments.
14. Supervise administration of management control system.
15. Supervise clerks, typists, or illustrators.
16. Supervise financial analysis activities.
17. Supervise graphics section.
18. Supervise management analysis specialists and/or technicians.
19. Supervise performance analysis.
20. Schedule procedural audits of management analysis work.
21. Supervise program analysis activities.
22. Supervise program reporting.
23. Supervise progress analysis activities.
24. Supervise resource analysis activities.
25. Supervise special management analysis studies.

C. SUPERVISING AUTOMATIC DATA PROCESSING EQUIPMENT OPERATIONS

1. Control tape utilization and assignment.
2. Coordinate errors in programming logic with programmers.
3. Coordinate one time report requirements with person of prime responsibility.
4. Coordinate scheduling of machine work load.
5. Coordinate with programmers and systems personnel on matters of joint interest.
6. Design system of magnetic tape management.
7. Develop computer operating instructions.
8. Establish data automation production controls and standards.
9. Evaluate office of prime responsibility equipment utilization and maintenance.
10. Evaluate performance history on specific jobs.
11. Evaluate work performance of operators.
12. Inform person of prime responsibility of repeated errors in input data.
13. Maintain operating manuals and directives affecting machine room function.
14. Maintain training records on operators.
15. Monitor the maintenance of utilization logs on automatic data processing equipment.
16. Perform periodic inspections of data automation activities.
17. Plan and conduct on-the-job training in data processing equipment operation.
18. Plan and conduct on-the-job training in data processing procedures.
19. Plan and schedule duty assignments for data automation activity.
20. Plan and schedule work assignments for operators.
21. Prepare cost reports and cost estimates for data automation equipment.
22. Prepare operating instructions concerning local reports.
23. Prepare recommendations for improved efficiency in automatic data processing equipment operations.
24. Prepare recommendations for local operating instructions concerning programs.
25. Prepare shift reports.
26. Requisition auxiliary data processing equipment such as decollaters or forms bursters.
27. Requisition supplies.
28. Review completed programs for accuracy.
29. Review or prepare cost estimates of equipment utilization.
30. Schedule basic input into automated data systems.
31. Schedule basic input into manual data systems.
32. Schedule machine inspection and repair.
33. Supervise apprentice data processing machine operators.
34. Supervise data processing machine operators.
35. Supervise data processing machine supervisors.

D. SUPERVISING PROGRAMMING

1. Conduct on-the-job training in programming.
2. Coordinate explanation or error print-outs with machine.
3. Coordinate flow of data from one report to another.
4. Coordinate programming requirements with machine configuration.
5. Coordinate with functional areas on programming aspects of new systems being devised.
6. Coordinate with functional areas on programming aspects of reports being developed.
7. Coordinate with operations on preparation of computer operating instructions.
8. Coordinate with systems designers on programming aspects of new systems.
9. Coordinate with systems designers on programming aspects of reports being developed.
10. Design operating systems.
11. Develop local operating procedures for programming.
12. Develop programming aids.
13. Develop program test and maintenance systems.
14. Establish controls for program card decks and magnetic files.

15. Establish programming priorities.
16. Establish run priorities for operations.
17. Establish stock levels of blank forms and coding sheets for programming.
18. Evaluate proficiency of programming personnel to determine training needs.
19. Evaluate programmers with respect to current techniques and methods.
20. Evaluate programming suggestions under incentive suggestion program.
21. Evaluate work performance of programmers.
22. Follow-up programs being developed at local level.
23. Initiate procedures for preparation of input to computer.
24. Lead inspection or conversion teams.
25. Maintain instruction worksheets for operational programs.
26. Maintain library of manuals, directives, or publications on computer programming.
27. Orient newly assigned programmers.
28. Perform follow-up review of new systems.
29. Plan programming work loads, make work assignments, and organize shifts.
30. Requisition programming aids.
31. Review detail flow charts prior to preparation of programs.
32. Schedule development of programs.
33. Supervise and edit documentation of programs.
34. Supervise apprentice programming specialists.
35. Supervise programming specialists.
36. Train function area personnel in statistics, mathematical models, or other scientific applications.

E. SUPERVISING DATA SYSTEMS ANALYSIS AND DESIGN

1. Control error correction reruns.
2. Coordinate with programming supervisors in designing new programming systems.
3. Coordinate with staff in the development of new systems.
4. Design presentations for staff viewing of computer systems utilization.
5. Document new computer processes.
6. Establish standard data elements, codes, and names for systems design.
7. Establish systems analysis and design priorities.
8. Establish systems analysis review schedules for existing systems.
9. Estimate systems analysis and design work requirement.
10. Evaluate work performance of systems analysis and design personnel.
11. Inspect systems analysis and design activities.
12. Maintain training records on systems analysis and design personnel.
13. Orient newly assigned systems design and analysis personnel.
14. Organize systems analysis design teams.
15. Perform large-scale computer scheduling.
16. Plan and conduct on-the-job training for systems analysis and design personnel.
17. Plan data systems analysis and design work loads.
18. Plan in-shop systems analysis and design personnel and evaluation requirements.
19. Prepare in-house reports on personnel and systems design activities.
20. Prepare recommendations for needed data systems equipment.
21. Requisition systems development aids.
22. Review requests for development of new systems.
23. Supervise data systems analysis and design specialists.

F. PERFORMING DATA PROCESSING FUNCTIONS

1. Arrange reruns and special checks to proof final output.
2. Audit data systems or functional area reports.
3. Check error with consultant, correct and resubmit.
4. Code frnctional area reports.
5. Compare data arithmetically with predetermined control totals.
6. Compile progress reports on data processed.

7. Compute due-in and due-out dates for controlled reports.
8. Contact functional areas for submission and evaluation of data.
9. Control automatic data processing equipment and data processing equipment orders.
10. Control basic input into automated data systems.
11. Control basic input into manual data systems.
12. Coordinate production control schedules.
13. Coordinate with operators, programmers, or systems personnel on matters of joint interest.
14. Develop data and documentation of accrued benefits resulting from installation of automatic data processing equipment.
15. Evaluate and dispose of administrative records.
16. Extract figures needed for special analysis and studies.
17. Maintain files of reports, regulation, or directives pertaining to data systems.
18. Maintain list of recurring reports.
19. Maintain publication files.
20. Maintain suspense file for controlled reports.
21. Notify office of prime responsibility of new or revised reporting requirements.
22. Operate office machines.
23. Perform annual reports survey.
24. Perform assembly, rearrangement, and spot edits.
25. Prepare and submit daily requirement notices to supportive services.
26. Prepare correspondence concerning data services.
27. Prepare data service forms.
28. Prepare operational briefings.
29. Prepare recommendations for improved efficiency in operations.
30. Process requests for new or revised reports.
31. Read and interpret regulations, manuals, or administrative orders.
32. Schedule computer runs for several days or more in advance.

G. PERFORMING MANAGEMENT ANALYSIS FUNCTIONS

1. Analyze programs, evaluations, reviews or reports for problem identification.
2. Analyze programs for relationship to business' financial budget.
3. Calculate ratios, percentages, means or standard deviations from reported data.
4. Calculate trends from reported data.
5. Compile and record data.
6. Coordinate with electronic data processing services to receive computer products to assist management analysis.
7. Coordinate with office of prime responsibility to evaluate factors and standards.
8. Develop index of unit performance.
9. Develop rating systems for evaluating unit performance.
10. Develop standards and factors for use in management control systems.
11. Develop systems for collecting, processing, and storing data.
12. Develop uniform factors for improved planning and programming.
13. Evaluate deviations from standards.
14. Evaluate programs for cost effectiveness.
15. Follow-up analyses, special studies, or staff studies.
16. Forecast trends in performing analysis tasks.
17. Maintain data bank.
18. Maintain files of management analysis work.
19. Obtain samples of data for use in analysis work.
20. Operate visual equipment.
21. Perform program analysis.
22. Perform progress analysis.
23. Perform special studies or staff studies.
24. Plot maps.
25. Prepare and maintain briefings and visual presentation files.
26. Prepare upper management briefings.

27. Prepare narrative reports showing results of analysis.
28. Prepare references for easy access to historical data.
29. Prepare reports relating data to local problems and management decisions.
30. Prepare statistical summaries of data.
31. Prepare summary cost reports.
32. Prepare operational reports.
33. Prepare visual materials for presentations.
34. Review maintenance data.
35. Review operating cost data.
36. Review unit and individual training data.
37. Use program evaluation review techniques (PERT) to analyze programs or to record program progression.

H. OPERATING AUTOMATIC DATA PROCESSING EQUIPMENT

1. Analyze job steps to determine data recovery points.
2. Analyze machine operation through use of messages received from the equipment.
3. Analyze machine operation through use of conditions displayed.
4. Determine cause of machine stops and malfunctions.
5. Interrogate memory locations on the console.
6. Load programs and data cards.
7. Locate tapes in storage media or tape library.
8. Maintain card files (source object, etc.).
9. Maintain current run tapes.
10. Maintain levels of data processing supplies.
11. Maintain technical files on equipment operation and procedural changes.
12. Make switch settings.
13. Operate card reader.
14. Operate collator.
15. Operate console.
16. Operate decollator.
17. Operate document writer.
18. Operate forms bursting equipment.
19. Operate interpreter.
20. Operate key punch machines or verifiers.
21. Operate magnetic tape unit.
22. Operate paper tape punch and reader.
23. Operate punched card accounting machines.
24. Operate remote terminals.
25. Operate reproducer.
26. Operate sorter.
27. Operate time sharing system terminal.
28. Perform card-to-printer operation.
29. Perform compilation or assembly.
30. Perform debugging runs.
31. Perform operator maintenance on automatic data processing equipment.
32. Perform punched card-to-tape conversion operation.
33. Perform tape-to-card conversion operation.
34. Perform tape-to-plotter operation.
35. Perform tape-to-printer operation.
36. Prepare control decks.
37. Prepare service action requests.
38. Prepare special carriage control tapes.
39. Record time log for unscheduled maintenance.
40. Review processing steps before job is put on computer.
41. Schedule sequence of users during shift for effective organization of runs.
42. Screen reports, cards, or programs for obvious errors and initiate corrections.

43. Select and mount disks.
44. Select and mount tapes.
45. Select subroutines to accomplish jobs received for processing.
46. Set up computer for operation.
47. Splice magnetic tape and leaders.
48. Splice paper tape.
49. Set up punched card accounting machines for operation.
50. Strip tape and add new load point.
51. Use absolute binary deck (ABS Deck) to rerun programs.
52. Update current source programs
53. Update systems programs (Object run tapes-ORTs)
54. Wire control panels.
55. Wire reproducer control panels.

I. PERFORMING SYSTEMS PROGRAMMING

1. Design assembly programs.
2. Design or write compilers.
3. Design support programs for cathode ray output.
4. Update systems monitoe programs.
5. Write programs to convert tapes from one computer to another.
6. Write programs to pring tapes, punch cards, or read cards.
7. Write systems monitor programs.

J. PERFORMING SCIENTIFIC PROGRAMMING

1. Analyze and modify computer languages.
2. Analyze seldom-used computer languages.
3. Construct mathematical models for programs.
4. Construct programs or routines using double precision floating points.
5. Construct programs or routines using simulated double precision floating points.
6. Construct programs or routines using simulated floating points.
7. Construct programs or routines using single precision floating points.
8. Construct simulated single precision floating points.
9. Develop general flow charts for scientific programming.
10. Develop guidelines and specifications for scientific programming.
11. Perform non-linear programming.
12. Use linear programming technique.
13. Use queuing theory to construct simulation models.
14. Write heuristic programs or use heuristic programming techniques.
15. Write programs for analysis of medical data.
16. Write programs for analysis of physical phenomena and development of equations.
17. Write programs for computer language development.
18. Write programs for correlation or regression analysis.
19. Write programs for data reduction.
20. Write programs for direct mathematical computations.
21. Write programs for equation solving.
22. Write programs for factor analysis.
23. Write programs for matrix multiplication.
24. Write programs for physical simulation using differential equations.
25. Write programs for random sampling.
26. Write programs for research information retrieval.
27. Write programs for simulation of functions using simulated language.
28. Write programs for simulation studies.
29. Write programs for testing mathematical hypotheses.
30. Write programs for testing statistical hypotheses.
31. Write programs to compute frequency distributions.

32. Write programs to do item analysis.
33. Write programs to compute means and standard deviations.

K. PROGRAMMING COMPUTERS

1. Adapt programs written in symbolic language to different computer configurations.
2. Analyze applications to select appropriate utility programs and subroutines.
3. Analyze computer inputs prior to test run and follow-up.
4. Analyze programming documentation.
5. Audit computer inputs after test run and follow-up.
6. Catalogue data sets.
7. Code computer applications using a reports program generator.
8. Code programs utilizing more than one language.
9. Code routine computer programs.
10. Code software utility programs.
11. Code tape sort programs.
12. Confer with functional area personnel to prepare specific program routines.
13. Coordinate with system design personnel to prepare overall block diagram.
14. Design disk storage allocation.
15. Design or lay out core storage formats.
16. Design or lay out disc storage formats.
17. Design or lay out drum storage formats.
18. Design or lay out magnetic tape storage formats.
19. Design or lay out paper tape storage formats.
20. Design random access formulas.
21. Design report formats.
22. Design software utility programs.
23. Design tape input/output formulas.
24. Design tape or disk sort programs.
25. Desk check or debug programs after assembly or compilation.
26. Desk check programming logic for punching errors prior to assembly or compilation.
27. Determine most applicable programming language for problems.
28. Develop flow charts for handling source data by off-line support equipment.
29. Develop operation procedures for programming.
30. Develop program logic charts for machine routines.
31. Develop subroutines.
32. Edit computer programs for effective use of auxiliary storage media.
33. Edit computer programs for efficient use of logical and arithmetical components.
34. Edit computer programs for effective use of memory.
35. Incorporate standard routines into programs.
36. Incorporate utility routines into programs.
37. Insert standard changes into existing programs.
38. Integrate planned routines with the overall programming systems (segmenting).
39. Isolate and correct programming errors discovered during testing.
40. Lay out memory maps.
41. Maintain and update library of program and processing documentation.
42. Maintain library of documentation of general purpose and utility programs.
43. Manually convert numbers from one number system to another.
44. Manually translate computer programs written in symbolic language into assembly language.
45. Patch computer programs.
46. Perform analog programming.
47. Perform real time programming.
48. Perform systems analysis to meet requirements of company functions.
49. Prepare console operator's run books.
50. Prepare control card sheets for utility or library programs.
51. Prepare detail flow charts.
52. Prepare documentation including formats and layouts for input and output media.

53. Prepare general and detailed flow charts.
54. Prepare instructions for operation of on-line peripheral equipment.
55. Prepare programming block diagrams.
56. Prepare testing instructions and control test data for use of console operator during test audits.
57. Recommend corrections or modifications to systems.
58. Review existing routines for applicability of new techniques.
59. Revise computer programs.
60. Select appropriate utility programs.
61. Test new computer programs.
62. Test revised computer programs.
63. Write consol program manuals.
64. Write programs for inquiry routines.
65. Write programs for local one-time applications.
66. Write programs for remote data input.
67. Write programs for the generation of data to be used for program testing.

L. PERFORMING FEASIBILITY STUDIES (PILOT PROJECTS)

1. Brief functional area personnel on limits of data processing.
2. Coordinate integration of systems with functional areas.
3. Coordinate requirements study with programmers and equipment operators.
4. Coordinate with functional areas to determine output requirements.
5. Determine communications requirements of DATA-PHONE.
6. Determine communications requirements of facsimile.
7. Determine input/output characteristics and media for functional areas.
8. Determine size and time-elements of processing runs.
9. Develop standard data elements and codes for functional areas.
10. Evaluate present and proposed costs of input/output requirements.
11. Evaluate present and proposed costs of processing, storage, and informational retrieval.
12. Evaluate use of existing systems or programs for pilot projects.
13. File and record characteristics and requirements for functional areas.
14. Investigate communications and teleprocessing requirements for integration of data systems and processing.
15. Investigate operating time of communications of teleprocessing requirements.
16. Plan functional integration of reports and systems.
17. Prepare computer logic diagrams.
18. Prepare detailed document flow diagrams.
19. Prepare feasibility study on present system to determine need for new system.
20. Prepare recommendations for size and capacity of proposed electronic data processing equipment.
21. Prepare responsiveness requirements (speed with which data processing personnel can react to new systems).
22. Supervise post-installation inspections of new systems.

M. DESIGNING DATA SYSTEMS

1. Audit mechanized listings to check out systems.
2. Control system input and output.
3. Coordinate with programmers and functional areas to establish new applications.
4. Design character recognition systems to include input/output equipment.
5. Design data conversion systems to include input/output equipment.
6. Design or modify audit traits.
7. Design or modify data interface requirements.
8. Design or modify feedback controls.
9. Design or modify systems to maximize integration of operations.
10. Design punched card media layouts.
11. Design punched tape media layouts.
12. Design systems to include tabular forms and visual displays.
13. Determine processing, storage, and retrieval techniques.
14. Inspect system flow.

15. Monitor updating of format and data items.
16. Plan utilization of photographic storage and retrieval equipment.
17. Prepare data automation proposals (DAP).
18. Prepare documentation for systems flow charts.
19. Prepare manual data systems reports.
20. Prepare or analyze data for testing new systems.
21. Prepare statistical reports about data systems.
22. Prepare systems block diagrams.
23. Recommend changes in data automation proposals to person of prime responsibility.
24. Review data automation proposals (DAPs) or proposals submitted by person of prime responsibility.
25. Review technological developments in communications or teleprocessing requirements.
26. Review technological developments in processing, storage, and information retrieval.
27. Study purpose and design or new systems.
28. Use factor analysis to design data systems.
29. Use linear programming to design data systems.
30. Use probability theory to design data systems.
31. Use queuing, gaming, or logical decision theories to design data systems.

N. PERFORMING DATA SYSTEMS ANALYSIS

1. Define objectives of system studies.
2. Develop directives pertaining to data systems.
3. Develop networks such as PERT, CPM, and LESS.
4. Evaluate data for duplications and unnecessary requirements.
5. Evaluate data for relationship of output to source documents.
6. Evaluate file contents and sequences.
7. Evaluate problem areas adaptable to modifications.
8. Evaluate utinlzation of output products.
9. Identify data interface requirements.
10. Identify problem areas in the system.
11. Identify source documents, internal files and final reports.
12. Perform initial analysis of requests for systems studies.
13. Prepare decision charts.
14. Prepare presentations on data systems operations.
15. Prepare grid and matrix charts of input, or output files.
16. Provide systems consultative services to potential customers.
17. Schedule systems studies.
18. Update and review schedules and program networks.

APPENDIX D
Revised Business Data Processing Task Inventory

APPENDIX D
REVISED DATA PROCESSING TASK INVENTORY

A. SUPERVISING DATA SERVICES FUNCTIONS

1. Analyze company operations to determine where most significant improvements can be made.
2. Analyze data processed for possible modification and combination of reports.
3. Analyze data processed to make sure that desired information is obtained.
4. Analyze documentation for completeness and accuracy for data processing operations and control.
5. Analyze functional area reports for format errors.
6. Balance and correct reports.
7. Brief supervisor and staff.
8. Conduct on-the-job training for data services personnel.
9. Coordinate work of data services unit with activities furnishing report data.
10. Develop standards and factors for use in management control systems.
11. Establish data services production controls and standards.
12. Evaluate work performance of data services personnel.
13. Fill out question and inventory forms.
14. Inspect methods used to process data.
15. Orient newly assigned data services personnel.
16. Maintain training records for data services personnel.
17. Monitor maintenance of utilization logs.
18. Monitor production controls and standards.
19. Monitor the meeting of deadlines.
20. Notify person of prime responsibility of deadlines.
21. Order data automation supplies and equipment.
22. Perform automatic data processing equipment financial planning.
23. Plan and schedule data services work assignments.
24. Plan facility modification.
25. Review machine run reports for accuracy.
26. Review operations to devise more efficient procedures.
27. Schedule input from person of prime responsibility.
28. Serve on inspection teams to evaluate other data systems units.
29. Supervise data services specialists.
30. Supervise distribution of reports or programs.
31. Supervise operation of punch card or tape filing systems.
32. Supervise the maintenance of publications and reports management authority files.

B. SUPERVISING AUTOMATIC DATA PROCESSING EQUIPMENT OPERATIONS

1. Control tape utilization and assignment.
2. Coordinate errors in programming logic with programmers.
3. Coordinate one time report requirements with person of prime responsibility.
4. Coordinate scheduling of machine work load.
5. Coordinate with programmers and systems personnel on matters of joint interest.
6. Design system of magnetic type management.
7. Develop computer operating instructions.
8. Establish data automation production controls and standards.
9. Evaluate office of prime responsibility equipment utilization and maintenance.
10. Evaluate performance history on specific jobs.
11. Evaluate work performance of operators.
12. Inform person of prime responsibility of repeated errors in input data.
13. Inventory electronic data processing supplies.
14. Maintain operating manuals and directives affecting machine room functions.
15. Maintain training records on operators.
16. Monitor the maintenance of utilization logs on automatic data processing equipment.

17. Perform periodic inspections of data automation activities.
18. Plan and conduct on-the-job training in data processing equipment operation.
19. Plan and conduct on-the-job training data processing procedures.
20. Plan and schedule duty assignments for data automation activity.
21. Plan and schedule work assignments for operators.
22. Plan personnel management.
23. Prepare cost reports and cost estimates for data automation equipment.
24. Prepare operating instructions concerning local reports.
25. Prepare recommendations for improved efficiency in automatic data processing equipment operations.
26. Prepare recommendations for local operating instructions concerning programs.
27. Prepare shift reports.
28. Requisition auxiliary data processing equipment such as decollaters or forms bursters.
29. Requisition supplies.
30. Review completed programs for accuracy.
31. Review or prepare cost estimates of equipment utilization.
32. Review personnel for raise recommendations.
33. Schedule basic input into automated data systems.
34. Schedule basic input into manual data systems.
35. Schedule machine inspection and repair.
36. Supervise apprentice data processing machine operators.
37. Supervise data processing machine operators.
38. Supervise data processing machine supervisors.
39. Train personnel in method of creating input and using output.

C. SUPERVISING PROGRAMMING

1. Analyze programs evaluations, reviews or reports for problem identification.
2. Conduct on-the-job training in programming.
3. Coordinate explanation or error print-outs with machine configuration.
4. Coordinate flow of data from one report to another.
5. Coordinate programming requirements with machine configuration.
6. Coordinate with functional areas on programming aspects of new systems being devised.
7. Coordinate with functional areas on programming aspects of reports being developed.
8. Coordinate with operations on preperation of computer operating instructions.
9. Coordinate with systems designers on programming aspects of new systems.
10. Coordinate with systems designers on programming aspects of reports being developed.
11. Design operating systems.
12. Develop local operating procedures for programming.
13. Develop programming aids.
14. Develop program test and maintenance systems.
15. Establish controls for program card decks and magnetic files.
16. Establish programming priorities.
17. Establish stock levels of blank forms and coding sheets for programming.
18. Evaluate programmers with respect to current techniques and methods.
19. Evaluate programming suggestions under incentive suggestion program.
20. Evaluate work performance of programmers.
21. Follow up programs being developed at local level.
22. Identify problem areas in existing systems.
23. Lead inspection or conversion teams.
24. Maintain instruction worksheets for operational programs.
25. Maintain library of manuals, directives. or publications on computer programming.
26. Orient newly assigned programmers.
27. Perform follow-up review of new systems.
28. Perform program analysis.
29. Prepare correspondence concerning data services.
30. Prepare operational briefings.
31. Process request for new or revised reports.

32. Read and interpret regulations manuals or administrative orders.
33. Review completed programs for accuracy.
34. Review detail flow charts prior to preparation of programs.
35. Review requests for development of existing systems.
36. Review unit and individual training data.
37. Schedule development of programs.
38. Supervise and edit documentation of programs.
39. Supervise apprentice programming specialists.
40. Supervise programming specialists.
41. Train functional area personnel in statistics, mathematical models, or other scientific applications.

D. SUPERVISING DATA SYSTEMS ANALYSIS AND DESIGN

1. Control error correction reruns.
2. Coordinate with programming supervisors in designing new programming systems.
3. Coordinate with staff in the development of new systems.
4. Design presentations for staff viewing of computer systems.
5. Document new computer processes.
6. Establish standard data elements, codes, and names for systems design.
7. Establish systems analysis and design priorities.
8. Establish systems analysis review schedules for existing systems.
9. Estimate systems analysis and design work requirements.
10. Evaluate work performance of systems analysis and design personnel.
11. Inspect systems analysis and design activities.
12. Orient newly assigned systems design and analysis personnel.
13. Plan data systems analysis and design work loads.
14. Prepare recommendations for needed data systems equipment.
15. Review requests for development of new systems.
16. Supervise data systems analysis and design specialists.

E. PERFORMING DATA PROCESSING FUNCTIONS

1. Arrange reruns and special checks to proof final output.
2. Audit data systems of functional area reports.
3. Check error with consultant, correct and resubmit.
4. Code functional area reports.
5. Compare data arithmetically with predetermined control totals.
6. Compile progress reports on data processed.
7. Compute due-in and due-out dates for controlled reports.
8. Contact functional areas for submission and evaluation of data.
9. Control automatic data processing equipment and data processing equipment orders.
10. Control basic input into automated data systems.
11. Control basic input into manual data systems.
12. Coordinate production control schedules.
13. Coordinate with operators, programmers, or systems personnel on matters of joint interest.
14. Develop and maintain procedures relative to computer input and product distribution including quality check.
15. Evaluate and dispose of administrative records.
16. Extract figures needed for special analysis and studies.
17. Maintain files of reports, regulations, or directives pertaining to data systems.
18. Maintain suspense file for controlled reports.
19. Notify office of prime responsibility of new or revised reporting requirements.
20. Perform annual reports survey.
21. Prepare and submit daily requirement notices to supportive services.
22. Prepare correspondence concerning data services.
23. Prepare data service forms.
24. Prepare operational briefings.
25. Prepare recommendations for improved efficiency in operations.

26. Process requests for new or revised reports.
27. Read and interpret regulations, manuals, or administrative orders.
28. Schedule computer runs for several days or more in advance.

F. OPERATING AUTOMATIC DATA PROCESSING EQUIPMENT

1. Analyze job steps to determine data recovery points.
2. Analyze machine operation through use of messages received from the equipment.
3. Analyze machine operation through use of conditions displayed.
4. Change sequence of jobs run to cut down operational steps.
5. Determine cause of machine stops and malfunctions.
6. Initiate all computer operating notes, technical bulletins, etc., for job performance improvements.
7. Interrogate memory locations on the console.
8. Load programs and data cards.
9. Locate tapes in storage media or tape library.
10. Log and scratch expired tapes in library.
11. Maintain card files (source object, etc.).
12. Maintain current run tapes.
13. Maintain levels of data processing supplies.
14. Maintain technical files on equipment operation and procedural changes.
15. Make switch settings.
16. Operate card reader.
17. Operate collator.
18. Operate console.
19. Operate decollator
20. Operate document writer.
21. Operate forms bursting equipment.
22. Operate interpreter.
23. Operate key punch machines or verifiers.
24. Operate magnetic tape unit.
25. Operate paper tape punch and reader.
26. Operate punched card accounting machines.
27. Operate remote terminals.
28. Operate reproducer.
29. Operate sorter.
30. Operate time sharing system terminal.
31. Perform card-to-printer operation.
32. Perform compilation or assembly.
33. Perform debugging runs.
34. Perform disk-to-plotter operation.
35. Perform disk-to-printer operation.
36. Perform on-the-job training of operators.
37. Perform operator maintenance on automatic data processing equipment.
38. Perform punched card-to-disk conversion operation.
39. Perform punched card-to-tape conversion operation.
40. Perform tape-to-card conversion operation.
41. Perform tape-to-plotter operation.
42. Perform tape-to-printer operation.
43. Perform tape-to-tape operation (copy).
44. Prepare lables for output tapes.
45. Prepare control cards for jobs.
46. Prepare control decks.
47. Record time log for scheduled jobs.
48. Record time log for unscheduled maintenance.
49. Review processing steps before job is put on computer.
50. Schedule sequence of users during shift for effective organization of runs.
51. Screen reports, cards, or programs for obvious errors and initiate corrections.

52. Select and mount disks.
53. Select and mount tapes.
54. Select subroutines to accomplish jobs received for processing.
55. Set up computer for operation.
56. Splice magnetic tape and leaders.
57. Splice paper tape.
58. Set up punched card accounting machines for operation.
59. Strip tape and add new load point.
60. Use absolute binary deck (ABS deck) to rerun programs.
61. Update current source programs.
62. Update systems programs (object run tapes-ORT's).
63. Wire control panels.
64. Wire reproducer control panels.

G. PERFORMING SYSTEMS PROGRAMMING

1. Analyze and debug manufactured software.
2. Design support programs for cathode ray output.
3. Develop maintenance procedures for the operating system.
4. Diagnose and correct operating system component errors.
5. Maintain back-up procedures for the operating system.
6. Maintain manufacturer supplies on-line teleprocessing system.
7. Perform system generation, establish source and relocatable library sizes, etc.
8. Plan, coordinate and install new hardware and software.
9. Select various components to be used in creating new operating system.
10. Work with operations supervisor to determine best operating procedures to be followed.
11. Write macros, catalog macros, standard source and relocatable data.
12. Write programs to convert tapes from one computer to another.
13. Write programs to print tapes, punch cards, or read cards.
14. Write systems monitor programs.

H. PERFORMING SCIENTIFIC PROGRAMMING

1. Analyze and modify computer languages.
2. Analyze seldom-used computer languages.
3. Construct mathematical models for programs.
4. Construct programs or routines using double precision floating points.
5. Construct programs or routines using simulated double precision floating points.
6. Construct programs or routines using simulated floating points.
7. Construct programs or routines using single precision floating points.
8. Construct simulated single precision floating points.
9. Develop general flow charts for scientific programming.
10. Develop guidelines and specifications for scientific programming.
11. Minimum program size.
12. Optimize program execution times.
13. Perform non-linear programming.
14. Use linear programming techniques.
15. Use queuing theory to construct simulation models.
16. Write heuristic programs or use heuristic programming techniques.
17. Write programs for analysis of medical data.
18. Write programs for analysis of physical phenomena and development of equations.
19. Write programs for computer language development.
20. Write programs for correlation or regression analysis.
21. Write programs for data reduction.
22. Write programs for direct mathematical computations.
23. Write programs for equation solving.
24. Write programs for factor analysis.

25. Write programs for matrix inversion.
26. Write programs for matrix multiplication.
27. Write programs for physical simulation using differential equations.
28. Write programs for random sampling.
29. Write programs for research information retrieval.
30. Write programs for simulation of functions using simulated language.
31. Write programs for simulation studies.
32. Write programs for testing mathematical hypotheses.
33. Write programs for testing statistical hypotheses.
34. Write programs to compute frequency distributions.
35. Write programs to do item analysis.
36. Write programs to compute means and standard deviations.
37. Write programs to produce design plans via use of plotter.
38. Write programs to provide design data.

I. PROGRAMMING COMPUTERS

1. Adapt programs written in symbolic language to different computer configuration.
2. Analyze applications to select appropriate utility programs and subroutines.
3. Analyze computer inputs prior to test run and follow-up.
4. Analyze core dumps, evaluate and recommend solutions.
5. Analyze programming documentation.
6. Analyze programs, evaluations, reviews or reports for problem identification.
7. Audit computer inputs after test run and follow-up.
8. Code computer applications using a reports program generator.
9. Code disk sort programs.
10. Code programs utilizing more than one language.
11. Code routine computer programs.
12. Code software utility programs.
13. Code tape sort programs.
14. Confer with functional area personnel to prepare specific program routines.
15. Coordinate with functional areas on programming aspects of new systems being devised and reports being developed.
16. Debug programs.
17. Design or lay out disk storage formats.
18. Design or lay out drum storage formats.
19. Design or lay out magnetic tape storage formats.
20. Design or lay out paper tape storage formats.
21. Design random access formulas.
22. Design report formats.
23. Design software utility programs.
24. Design tape input/output formulas.
25. Design tape or disk sort programs.
26. Desk check or debug programs after assembly of compilation.
27. Desk check programming logic for punching errors prior to assembly or compilation.
28. Determine most applicable programming language for problems.
29. Develop flow charts for handling source data by off-line support equipment.
30. Develop computer operating instruction, technical bulletins.
31. Develop operation procedures for programming.
32. Develop program logic charts for machine routines.
33. Develop subroutines.
34. Develop systems for collecting, processing, and storing data.
35. Edit computer programs for effective use of auxiliary storage media.
36. Edit computer programs for efficient use of logical and arithmetical components.
37. Edit computer programs for effective use of memory.
38. Exploit parallel processing capabilities to gain operational effectiveness.
39. Extract figures needed for special analysis and studies.
40. Incorporate standard routines into programs.

41. Incorporate utility routines into programs.
42. Integrate planned routines with the overall programming systems (segmenting).
43. Isolate and correct programming errors discovered during testing.
44. Lay out memory maps.
45. Maintain and update library of program and processing documentation.
46. Maintain library of documentation of general purpose and utility programs.
47. Manually convert numbers from one number system to another.
48. Manually translate computer programs written in symbolic language into assembly language.
49. Patch computer programs.
50. Perform analog programming.
51. Perform program analysis.
52. Perform real time programming.
53. Perform systems analysis to meet requirements of company functions.
54. Prepare console operator's run books.
55. Prepare control card sheets for utility or library programs.
56. Prepare detail flow charts.
57. Prepare documentation including formats and layouts for input and output media.
58. Prepare general and detailed flow charts.
59. Prepare instructions for operation of on-line peripheral equipment.
60. Prepare programming block diagrams.
61. Read and interpret regulations, manuals, or administrative orders.
62. Recommend corrections of modifications to systems.
63. Review existing routines for applicability of new techniques.
64. Revise computer programs.
65. Select appropriate utility programs.
66. Test new computer programs.
67. Test revised computer programs.
68. Write consol program manuals.
69. Write programs for inquiry routines.
70. Write programs for local one-time applications.
71. Write programs for the generation of data to be used for program testing.

J. PERFORMING FEASIBILITY STUDIES (PILOT PROJECTS)

1. Brief functional area personnel on limits of data processing.
2. Coordinate integration of systems with functional areas.
3. Coordinate requirements study with programmers and equipment operators.
4. Coordinate with functional areas to determine output requirements.
5. Determine input/output characteristics and media for functional areas.
6. Determine size and time elements of processing runs.
7. Develop standard data elements and codes for functional areas.
8. Evaluate present and proposed costs of input/output requirements.
9. Evaluate present and proposed costs of processing, storage, and informational retrieval.
10. Evaluate use of existing systems of programs for pilot projects.
11. Investigate communications and teleprocessing requirements for integration of data systems and processing.
12. Plan functional integration of reports and systems.
13. Prepare computer logic diagrams.
14. Prepare detailed document flow diagrams.
15. Prepare feasibility study on present system to determine need for new system.
16. Prepare recommendations for size and capacity of proposed electronic data processing equipment.
17. Supervise post-installation inspections of new systems.

K. DESIGNING DATA SYSTEMS

1. Audit mechanized listing to check out systems.
2. Control system input and output.
3. Coordinate with programmers and functional areas to establish new applications.

4. Design data conversion systems to include input/output equipment.
5. Design or modify audit traits.
6. Design or modify data interface requirements.
7. Design or modify feedback controls.
8. Design or modify systems to maximize integration of operations.
9. Design punched card media layouts.
10. Design punched tape media layouts.
11. Design systems to include tabular forms and visual displays.
12. Determine processing, storage, and retrieval techniques.
13. Inspect system flow.
14. Monitor updating of format and data items.
15. Prepare data automation proposals (DAP).
16. Prepare documentation for systems flow charts.
17. Prepare or analyze data for testing new systems.
18. Prepare statistical reports about data systems.
19. Prepare systems block diagrams.
20. Recommend changes in data automation proposals to person of prime responsibility.
21. Review data automation proposals (DAP's) or proposals submitted by person of prime responsibility.
22. Review technological developments in communications or teleprocessing requirements.
23. Review technological development in processing, storage, and information retrieval.
24. Study purpose and design or new systems.

L. PERFORMING DATA SYSTEMS ANALYSIS

1. Define objectives of system studies.
2. Develop directives pertaining to data systems.
3. Evaluate data for duplications and unnecessary requirements.
4. Evaluate data for relationship of output to source documents.
5. Evaluate file contents and sequences.
6. Evaluate problem areas adaptable to modification.
7. Evaluate utilization of output products.
8. Identify data interface requirements.
9. Identify problem areas in the system.
10. Identify source documents, internal files and final reports.
11. Perform initial analysis of requests for systems studies.
12. Prepare decision charts.
13. Prepare presentations on data systems operations.
14. Provide systems consultative services to potential customers.
15. Update and review schedules and program networks.